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THE IRON TRADE REVIEW

VOLUME XXXIII. CLEVELAND, O. MAY 24, 1900. CHICAGO, ILL. NUMBER 21

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THE IRON TRADE REVIEW

VOLUME XXXIII. CLEVELAND, O. MAY 24, 1900. CHICAGO, ILL. NUMBER 21

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

The iron trade is slowing almost to a standstill. An almost entire absence of buying and at the same time a rate of consumption known to be close to the highest, if not the highest, make a combination the trade has never seen, and it is not surprising that those longest in the business are puzzled by it. Sellers continue to reiterate that old contracts are nearing the end and that buying on a liberal scale must soon be resumed, but the fact remains that consumers are rigid in their abstention from the market, and as a rule give no indication of any early change in policy. No development of the past week throws any light on the situation. Prices have gone practically unchanged, while the dullness in all lines has become more pronounced. It appears that few of the inquiries made result in business, and it is probable that many of the inferences made by bidders as to the success of competitors in getting business are wrong, and that instead of closing elsewhere at a lower price the inquirer simply did nothing. The large steel companies have diagnosed the situation as one not to be helped by reducing prices. No change has been made in the $35 agreement as to billets; but no steel is sold at that price. The same is true as to the 2c basis for steel bars. Recently billet business has been going to one or two mills outside the agreement at $30 to $31 Pittsburg, and it now appears that $29 can be done on a good order. In the past week the large producers also have been cutting the $35 price, and the steel market may practically be treated as an open one, though no formal change in the agreed quotation is announced. Open-hearth billets also have been considerably reduced. No action has been taken on Bessemer pig iron, but Eastern producers have made small sales in the Pittsburg district below the $24.90 basis of the associated furnaces and the latter price may be treated as of the past. The feeling seems to be on all hands to let the market work out its own future, and meantime buyer and seller are having as little to do with it as possible. How this will end the wisest heads in the trade do not predict. The probability that the scale demands of the Amalgamated Association will cause a longer shut down than usual does not disturb consumers as yet. From the standpoint of the mills a suspension of several weeks would be beneficial and it need not be expected that the wage advances which it is intimated will be asked for will be concurred in readily, if at all. It is known that a number of furnaces in the Mahoning and Shenango valleys are about to make repairs. Some suspensions in other districts are expected, also, after long campaigns on high priced iron. It is not certain, therefore, that stocks of iron will be greatly increased, even with a protracted shut down of the mills. The foundry trade appears to have ceased buying. Many contracts for castings run out with July 1, and there is great uncertainty as to the basis on which they will be renewed. Steadily lower prices for castings have been made in the past few weeks and in malleable lines the curtailment of business and the falling of prices have been pronounced. The arbitration of the machinists' demands by the New York conference has cleared up one threatening feature, but it will not bring back, for 1900 at least, the business that has been postponed because capital took alarm at the general restlessness of labor.

PITTSBURG.

OFFICE OF *The Iron Trade Review*,
828 PARK BUILDING, May 23.

Notwithstanding rumors to the contrary no general reductions in quotations was authorized at the meeting of the executive committee of the National Tube Co., last week. While it is true that concessions have been made since the first of April, prices have been only readjusted to meet existing conditions. Despite the fact that the general demand is very limited a contract was closed this week for 25 miles of line pipe and one last week for 22 miles. The low prices on plates have a tendency to simulate demand for that product, and the orders taken in the past few days have exceeded in number those taken in the two weeks previous. Furthermore 1.70c rather than 1.65c seems to be the prevailing quotation on tank plates. The plates to be used for the pipe line for the New Jersey water-supply plant will undoubtedly be furnished by the leading plate interest, 15,000 tons being required. No contract has been let as yet and it is doubtful if the entire amount will be placed immediately. An informal meeting of the steel billet manufacturers last week resulted in no change of quotations. They are holding their product at $35 nominally, although much lower prices are being made in actual transactions. It is the evident intention not only of the leading steel companies but of all other producers that are parties to gentlemen's agreements to make no formal reductions as long as consumers are showing no disposition to buy. They argue that to do so would only tend to demoralize the market and believe that very little business is ever done in a pronounced decline. The same holds true of the furnacemen. They are not urging the foundrymen to buy. They are letting them bide their time, knowing consumers stocks are depleted and that the buying movement must set in sooner or later. Only nominal quotations can be secured on many lines of material. Scrap iron and steel have been affected the same as other products and quotations are only nominal.

PIG IRON.—There has been little doing in Bessemer the past week, a few small lots being sold for immediate delivery. The nominal quotation of $24 is still being maintained but it is doubtful whether that price would be asked on any considerable order. Consumers are not making inquiry for second-half delivery and in the absence of a demand the association will not announce a quotation in advance. The foundrymen in this district are still holding off for better quotations which they hope will result from their refusal to come into the market. The furnacemen have about given up all hope of securing business by solicitation and are waiting for buyers to come into the market after it appears that such a slump as seems to be looked for in some quarters does not materialize. There have been few car lot sales of foundry iron and a few small sales of forge. Slight concessions are being made by the furnacemen but no big drop from existing quotations has been reported, as sellers believe no more business would come of it. We quote as follows:

Bessemer, valley furnace	$24.00
Bessemer, Pittsburg	24.90
No. 1 Foundry	$22.00 to 22.25
No. 2 Foundry	21.00 to 21.25
No. 3 Foundry	20.00 to 21.25
Gray Forge, valley furnace	19.00 to 19.25
Gray Forge, Pittsburg	19.25 to 19.50

STEEL.—The steel billet men at an informal meeting held last week decided that conditions did not warrant a change in

the existing quotation of $35 for 4x4 billets, which is merely a nominal price, no sales having been made at that figure of late. It is reported that billets can be had at $29 for desirable orders and that $30 is being quoted to consumers for small lots for immediate delivery. Even at these quotations there is little doing. There has been nothing done in sheet bars for some time and no quotations can be made.

FERRO-MANGANESE.—The nominal quotation for 80 per cent continues to be $125, though it is understood $100 or better could be had on desirable orders.

RAILS AND TRACK MATERIAL.—No new business on rails has been done by the mills in this district for some time. Mills working at present are engaged on back orders, which include a goog tonnage of foreign business. The rail mill at the Ohio works of the National Steel Co., was put in operation last week on orders placed some time ago. There is little doing in track material. Our quotations are as follows: Rails, standard sections, over 200 tons, $35; 100 to 200 tons, $37; car lots, $38; less than car lots, $40; light rails, 25-pound and less than 50-pound, $37; all f. o. b. mill, Pittsburg; track material—spikes, 2.35c to 2.40c; track bolts, square nuts, 3.40c to 3.50c; hexagon nuts 3.50c to 3 75c; splice bars, 2 35c to 2.50c.

SPELTER.—The price of spelter has not varied to any great extent during the past week and prime Western grades are quoted at 4.60c to 4.65c.

SKELP.—The demand for skelp continues to be very limited. The pipe and tube manufacturers are not making purchases owing to the big falling off in their business and quotations are merely nominal. We quote grooved iron and steel skelp at 1.75c to 1.80c and sheared at 1.80c to 1.85c.

MUCK BARS.—No sales of muck iron have been reported during the past few days. Mills are quoting $30 to $31 with a reduction of $1 per ton for scrap muck.

BARS.—The buying of steel bars has not been stimulated by the action of the steel bar association by reaffirming the 2c rate. Little business is being placed, although it is claimed by the mills in the agreement that most of the orders being taken are at the association price. Independent mills continue to cut the 2c rate in some cases to the extent of .25c. While the valley mills are holding iron bars at 1.90c it is claimedthat this price is being shaded. Refined iron bars are being quoted at 2c to 2.05c.

STRUCTURAL MATERIAL.—Considerable small business continues to be placed for structural material and the mills are being operated at their fullest capacity. More business is being done in this line than in any of the other finished products. Prices remain firm and unchanged and are as follows: Beams and channels, 3 to 15 inches, 2 25c; 18 to 24 inches, 2.55c; tees, 2 30c; zees, 2.25c; angles, from 1½ to 6 inches, 2.10c to 2.25c. Universal mill plates, 1.70c to 1.80c, according to delivery and size of order.

PIPES AND TUBES.—Officials of the National Tube Co. deny that a reduction in prices was authorized at the meeting of the executive committee held in New York last week. Prices have been adjusted to meet existing conditions since the first of April. While concessons have been made on merchant pipe nothing general has been done on tubes and casings and no new list of discounts has yet been issued to the trade. Despite the fact that trade is generally dull an order for 25 miles of line pipe was received several days ago and last week one order for 22 miles of the same kind of pipe for domestic use was placed.

PLATES.—The low price on tank plate has stimulated the demand considerably and large producers report that the prevailing price received is 1.70c rather than 1.65c, the price reported for large orders. While it is almost a certainty that the Carnegie Steel Co. will receive the contract for furnishing the 15,000 tons of plates required for the pipe line for the Jersey City water plant it is stated that the business has not been placed as yet, and that when it does come, delivery will extend over a considerable period, prices being fixed to the market at the time of delivery. On tank plates we quote 1 65c to 1.70c and on shell steel 1.80c to 1.90c. Flange is held at 1.95c to 2.5c while fire box and special grades range in price from 2.50c to 3.25c.

SHEETS.—Despite the fact that a few of the mills of the American Sheet Steel Co. are closed at the present time a good demand is reported. The idle mills in nearly every case have been shut down temporarily for needed repairs. The much expected list trade quotations have not yet been issued. On No. 28 gauge, black sheets, 3.25c to 3 30c is the reported quotation on specifications and on No. 27 gauge 3.15c to 3.20c. The discounts on galvanized sheets are 70 and 10 with the usual 15-cent freight allowance.

OLD MATERIAL.—There is very little demand for old material in this market. On the other hand mills are offering very little of their scrap for sale. We make the following quotations: New Bessemer melting stock, $19: old steel rails mixed lengths, $20 to $21; short lengths, $21 to $22; old iron rails, $22 to $23; cast borings, $11 to $12, gross tons; cast scrap, $14 to $15; No 1 wrought scrap, $19 to $20, net tons; busheling scrap, $14 to $15, net tons; old car wheels, $20 to $21.

COKE.—A number of the ovens in the coke regions were shut down during the past week owing to the falling off in demand. Rather than accumulate enormous stocks the producers believe that prices can better be maintained with small stocks. The coke pile of the Carnegie Steel Co. at Rankin is fast being removed. The work was commenced several months ago. Lower prices prevail on both foundry and furnace coke. The former is held at $3.25 and the latter at $3 to $3.25. The Connellsville *Courier* reports that from May 5 to May 12 the shipments from that region were 9,785 cars, or a falling off of 1,266 cars for the preceding week. There were 20,263 active ovens, an increase of 45, and their output was 182,659 tons.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
1542 MONADNOCK BLOCK, May 22.

The demand in the week has been light, and has not included any very large orders for any kind of material. What buying has been done has been for immediate shipment, but as a rule the seller has secured full prices for his product. Some selling has been done from second hands, and this has been closed at quotations quite a little under those we make. Mills and furnaces, however, have been firm in their prices, and have made no concessions. The tonnage of the week has been light, and it is not expected that the immediate future will show any large gain.

PIG IRON.—There has been very little business closed in the week. The demand has been almost entirely for small lots, and sales have been correspondingly small. Foundries as a rule are using about as much material as they have in the past, with the possible exception of malleable iron makers, who have not done as large a business as in the past few months. Gray iron foundries are using iron about as fast as furnaces can get it to them, and many of them have put in "rush "orders with the furnaces for their iron. On the other hand, many malleable iron makers find that the demand for their goods has decreased in the past few weeks, and as a consequence they are not using their iron as fast as before, and in some cases are asking that shipments be held up. Quotations are stationary as below:

Lake Sup. Charcoal	$24 50 @ $25 50	Southern Coke No. 3	$20 85
Local Coke Fdy. No. 1	23 00 @ 24 00	Southern No. 1 Soft	21 35 @ $22 85
Local Coke Fdy. No. 2	22 00 @ 23 00	Southern No. 2 Soft	21 85 @ 21 85
Local Coke Fdy. No. 3	21 00 @ 22 00	Southern Silveries	23 35 @ 23 85
Local Scotch Fdy. No. 1	23 00 @ 24 00	Jackson Co. Silveries	31 50 @ 34 50
Local Scotch Fdy. No. 2	22 00 @ 23 00	Ohio Strong Softeners	24 00 @ 25 00
Local Scotch Fdy. No. 3	21 00 @ 22 00	Alabama Car Wheel	23 50 @ 24 00
Southern Coke No. 1	22 35 @ 22 85	Malleable Bessemer	22 50 @ 23 00
Southern Coke No. 2	21 35 @ 21 85	Coke Bessemer	24 00 @ 25 00

BARS.—The demand has not been large, and sales have been limited to small lots in almost every case. There have been no large inquiries in the market, and none are expected to come up for the next few weeks. Prices are unchanged at 2.05c for iron, and 2.10c for steel, half extras, Chicago delivery, though some mills are making quotations under these figures.

CARS.—No business of consequence was closed last week. The principal inquiry was for 1,000 cars for the Northern Pacific which was not closed, but will probably be given out this coming week.

PLATES.—The demand is almost entirely for small lots for immediate shipment. No large contracts have been placed, and the inquiries have been almost entirely for small lots. We quote tank steel from store 2.15c to 2.20c. Mill shipments Chicago delivery: Tank steel 1.85c to 1.90c; shell, 1.90c to 1.95c; flange 1.95c to 2c; marine, 1.95c to 2c; fire box 2.75c and up, according to brand.

RAILS AND TRACK SUPPLIES.—Some fairly good sales of light rails were made in the week, but the orders for standard sections were for only small lots. Quotations follow: Rails, standard sections, $35 to $38; light sections, 37 to $42; splice bars, 2.50c to 2.70c; spikes, 2.65c to 2.75c; track bolts, 3.85c to 3.95c.

STRUCTURAL MATERIAL—The local building trades' strikes are still unsettled, but it is thought they may reach a settlement within a short time and that business will make a fairly respectable total for the season, notwithstanding the long delay. Last week's business was very light, both for local and nearby business, and did not include any large orders. Quotations follow: Beams, 15 inches and under, 2.40c; 18 inches and over, 2.50c; angles under three inches, 2.20c; over six inches, 2.50c; three inches to six inches, 2.40c; sheared plates, 1.85c to 1.95c; universal plates, 1.85c to 1.95c; tees 2.45c; zees, 2.40c; small lots from store are quoted ¼c to ½c higher.

SHEETS.—The demand is not large, and sales have been limited to comparatively small lots in almost every case One or two fairly good orders for mill shipment were closed in the week. No. 27 black sheets are quoted at 3.55c to 3 60c for mill shipments, and galvanized at 70 to 70 and 5 per cent off for store orders.

MERCHANT STEEL.—There is no change in the situation. The demand is fairly good, and one or two quite good orders were received in the week. Consumers' trade still is taking the bulk of the business. Smooth finish tire steel is quoted 2.80c to 3c; smooth finish machinery steel, 2.95c to 3.05c; spring steel, 3.65c to 3.75c; tool steel, 7c to 7.50c; special, 13.50c and upwards.

MERCHANT PIPE.—The local demand has been somewhat better in the past week, and while no large orders have been closed, the sales of the week have been quite a little in excess of those of the week previous. One large contract closed was for 25 miles of pipe line for Indiana, aggregating over 1,400 tons of pipe. The National Tube Co. has as yet made no announcement of its prices, and the market is still unquotable as a consequence.

WIRE AND WIRE NAILS.—The demand has included several orders of considerable size in the week. The principal maker of wire products reports a much better trade than was the case before the reduction in prices. There have been no changes in quotations. Makers quote single car loads of wire nails at $2.53 f. o. b. Chicago, and $2.63 for less than car loads. On wire, current quotations are as follows: Plain annealed wire, $2.48; painted barb wire, $2.98; galvanized barb wire, $3.13.

OLD MATERIAL.—The demand has been light and sales have been of small volume. The principal item of interest of the week has been the offerings of old wheels on the part of some of the large Western railroad systems, which have resulted in marked reductions in prices in old wheels. Revised quotations are given below; these represent dealers' selling prices:

Old iron rails	$18 00@$19 00	Country malleable	$13 00@$14 00
Old steel rails, long	18 00@ 19 00	Iron axles	23 00@ 24 00
Old steel rails, mixed	14 00@ 15 00	Cast borings	6 00@ 7 00
Relaying rails	28 00@ 30 00	Wrought turnings	11 50@ 12 00
Old wheels	20 00@ 22 00	Iron axle turnings	12 00@ 13 00
Railroad forge	18 00@ 19 00	Steel axle turnings	11 50@ 12 00
Dealer's forge	14 50@ 15 00	Mixed country steel	10 00@ 11 00
No. 1 cut mill	13 00@ 14 00	Stove plates	8 00@ 8 50
Heavy cast	10 00@ 11 00	Heavy melting steel	13 00@ 14 00
Railway malleable	16 00@ 17 00	Old iron splice bar	20 00@ 21 00

CLEVELAND.

OFFICE OF *The Iron Trade Review*,
27 VINCENT ST., May 23.

The ore and vessel situation reflect in a measure the condition of the iron market in finished lines. Perhaps too much significance should not attach to current wild rates on ore, since very little tonnage is offered and little is required, nearly the equivalent of last year's ore shipments being provided for in season charters or in boats connected with mining interests. It is known, however, that a large block of tonnage was taken presumably for the ore trade, that may or may not carry ore, according as the developments of the next three months bear out the estimates of last November as to the amount of ore that will be taken. There is reported to be a shading of the top prices on some recent offerings of Mesabi ore, but there is so little doing at present that this does not signify as yet. The problem yet to be worked out is how much of the furnace capacity supplied by Lake Superior ores will be steadily active between today and May 1, 1901. If prices of pig iron decline materially, the estimates of ore consumption at the prices established for 1900 must undergo some revision. In the past week a few Escanaba cargoes were placed at 70 cents, and $1 can be done from the head of the lake, but no Marquette business is reported.

PIG IRON.—The market is dead. Thus far only a few foundries in this district have asked for the holding up of shipments. Nearly all are running quite full, but there is much uncertainty as to the amount of business they will have when present contracts for castings are completed. In the next two months a good many pig iron contracts will be finished, but there is no sign of buying yet. In some lines as in stoves, it is known that foundry products have accumulated, and the maker will work them off before making any large purchases of pig iron. In the past week even carload orders have been practically unknown. Prices are uncertain, and it would be useless to predict the figures that would be called out by a 1,000-ton inquiry. Forge iron is a trifle lower at $19.25 to $19.50, valley. Nominally the going quotation on No. 2 foundry is $21, valley furnace. We quote for Cleveland delivery:

Bessemer	$24 90	Valley Scotch No. 1	$22 25@$22 50
No. 1 Strong Foundry	22 25@ 22 50	Valley Scotch No. 2	21 50@ 21 75
No. 2 Strong Foundry	21 50@ 21 75	Gray Forge, valley	19 25@ 19 50
No. 3 Foundry	20 75@ 21 00	Lake Superior Charcoal	23 00@ 24 00

FINISHED MATERIAL.—Inquiry has been light in the past week and sales less, making probably the dullest week of the year. There are indications that the steel market is getting into closer relation with finished material, and the $35 Pittsburg basis for billets is being cut even by the larger concerns, though no formal reduction has been made. The largest inquiry in the week was in plates and shapes for vessel construction at Toledo, prices being asked on 2,500 tons and 7,500 tons, the amount of business depending on whether one or three vessels are built. For the moment a cessation appeared in the steady run of plate business noted in the past week, but mills are now fairly employed and 1.70c, Pittsburg, is more frequently quoted on tank than 1.65c. There is no formal change in the price of bar iron, but 1.90c, valley, has been shaded. Steel bars range from 1.75c to 2c, Pittsburg. We continue the quotation of 3.20c, Cleveland on No. 27 black sheets, and of 2.25c, Pittsburg, on beams and channels. It is reported that no shipments of bars and angles have yet been made from the local American Steel & Wire Co. plant, but orders are being taken at generally ruling prices. The merchant pipe trade is quiet. No general revision of discounts has been given out, but concessions are being made both by jobbers and manufacturers.

WIRE AND WIRE NAILS.—The demand is better than under the old schedule of prices, but as in other departments of the market buyers are not contracting freely. Mills are being operated on full schedules. We quote Pittsburg mill prices in carload lots to retail buyers: Wire nails, $2.35; plain annealed wire, $2.30 base, painted barb wire, $2.80; galvanized, $2.95.

OLD MATERIAL.—Quotations are only nominal, there being practically no demand. Sellers make inside prices whenever they are able to work off anything in stock. We quote f. o. b. Cleveland: Old iron rails, $20 to $21 gross ton; old steel rails, $18.50 to $19 gross ton; No. 1 wrought scrap, $18 net tons; mill scrap $12.50 to $13 net ton; No. 1 machine cast scrap, $14.50 net ton; wrought turnings, $11 net ton; cast borings, $9.50 net ton; stove plate, $9 net ton; car wheels, $22 gross ton.

PHILADELPHIA.

May 21.

Dullness seems to be more pronounced in the local iron market. In some lines there is an almost total absence of orders. It is recognized on all sides that this is no time to place orders for large quantities of material. From one day to another slight variations in the volume of business appear, and now and again some seller is led to believe that there is some quickening in demand. But this soon gives way to apathy, and the idea that the season's needs have started a buying movement is given up It is perfectly well recognized that there must be an end to the prevalent hesitation and uncertainty; but it is known that this cannot come until there has been a radical reduction in prices of certain primary and half-finished

materials. The influence of a readjustment of Bessemer pig iron and steel billets to the present basis of finished material prices would be far-reaching. It seems to be the policy of the large interests to push this question as far as possible into the future, so that meantime deliveries on old contracts may be cleaned up and the market put in readiness for the drop. It is known that a reduction in the price of so pivotal a product as steel would affect prices from top to bottom—all kinds of pig iron as well as finished material. The steady though not great, increase in pig-iron stocks has its effect on prices, together with the approach of the midsummer season, and the expected closing of mills, particularly in the western districts. It is seen that a change in buyers' habits is not likely to come now until fall, and then the result of the election will probably be awaited before any extensive commitments are made. We quote No. 1 foundry iron, standard brand at $22.50; No. 2X foundry at $20.50 to $21.50; No. 2 plain at $19.50 to $20.50; gray forge $17.75 to $18.25. There is no market for billets and nominal prices are $31.50 and $32. Reports from the mills indicate that there is in some quarters urgent pressure to sell. Some new business has been taken in structural material, and the new bridge consolidation promises to aid in the maintaining of prices in their line. Plates are in good demand and at the same time prices are at the lowest point. We quote 1.75c to 1.80c for tank steel. On beams and channels we continue the quotation of 2.40c for material up to 15 inches in width; on angles 2 30c to 2.40c. Bar iron is weak and mill schedules show some falling off in operations. We quote 1.75c to 1 80c and on steel bars 2.05c. Sheets continue on a basis of 3.20c for No. 27. It would seem that with the present level of prices and the tendency toward a lower basis some mills that started up to take advantage of the boom will soon have to drop out. The market for old material is hard to place. Buyers can shade prices generally quoted, and on material which dealers are compelled to unload very low prices are made. We quote as follows: Choice railroad scrap, $21.50 to $22.50; No. 1 yard scrap, ordinary, $17.50 to $18; No. 2 light scrap, $13.50 to $14; machinery cast, $15.75 to $16.50; heavy steel scrap, $19 to $20; old iron rails, $22 to $23; old steel rails, $20 to 21; wrought turnings, $14 to $14.50; cast borings, 11.50 to 12.25; old car wheels, $22 to $23; iron axles, $24 to $26; steel axles, $24 to $25.

BIRMINGHAM.

May 21.

Furnace No. 1, of the Sloss-Sheffield Steel & Iron Co., which was forced to close down three weeks ago on account of an explosion, resumed operation last Wednesday morning and is now turning out 200 tons of pig iron daily. The stockhouse and trestles which were destroyed by fire at the time of the explosion have been rebuilt and a new coal washer is being erected to take the place of the one burned at the same time.

The Sloss-Sheffield Co. has applied to have its stock listed on the New York Stock Exchange and a few days ago filed a schedule as required by the rules of that organization. The capital stock of the Sloss-Sheffield Co. is $20,000,000. The company was incorporated under the laws of New Jersey last year.

The Alabama Consolidated Coal & Iron Co. has just completed a six mile railroad from Brookwood, Tuscaloosa county, to Searles in the same county. This road is to be used for handling coal from the company's mines, the coal to be used at the furnaces at Birmingham, Gadsden, Ironaton, and Shelby. This company's blast furnace at Ironaton has been ready for the torch the past two months but on account of the lack of a supply of material has remained idle.

Baltimore and Virginia stockholders of the Alabama Consolidated Coal & Iron Co. were in Birmingham the past week looking over the company's properties. It is understood that extensive improvements are to be made, though the nature of these has not been given out.

Two thousand tons of pig iron made in the Birmingham district destined for Genoa, Italy, were exported from New Orleans last week. About this amount of tonnage goes out of that port each week.

The rolling mills of Birmingham which went on half time 10 days ago have resumed full time.

The Republic Iron & Steel Co. is building a $35,000 coal washer at Thomas. This washer will be used to prepare coal for the company's coke ovens now being built at Thomas, three miles from Birmingham.

The foundries of this city have had a heavy run of business since the first of the year and are now behind with orders The Birmingham Machine & Foundry Co. is working on heavy machinery for several companies.

The tone of the local iron market has strengthened some the past week and some good offers are reported by the furnace companies. Prices, however, have not changed, No. 1 foundry remaining at $18 per ton. The demand for export iron is somewhat improved and it is stated that more than enough business has been offered to take up all the available bottoms for the balance of the year.

American Steel Hoop Co. Changes.

It was announced this week by the officials of the American Steel Hoop Co., whose offices are in the Empire Building, Pittsburg, that the executive and sales department would be removed to the Battery Park Building, New York, where the offices of the National Steel Co., American Tin Plate Co. and the American Sheet Steel Co. are located. It has been practically decided that the engineering and operating departments retain their offices in Pittsburg. It is also said that there will be some change in the management of the company at the annual meeting of the stockholders to be held next Tuesday. At that time it will also be definitely decided what departments shall be removed and what officials shall remain in charge of the Pittsburg office.

The American Steel Hoop Co. has purchased the bar mills of the Aetna-Standard works at Bridgeport and Mingo Junction, O., the sheet department of which were recently acquired by the American Sheet Steel Co.

American Bridge Company.

The transfer of the 26 bridge works included in the American Bridge Co.—the list given in our issue of May 10—was made at New York on Saturday, May 12, and all have been operated under the new control since that date. The election of officers was held at New York on Tuesday, May 22, and as expected, Percival Roberts, Jr., of the Pencoyd Iron Works, was made president. The vice-presidents are W. H. McCord, of Post & McCord, Brooklyn, N. Y.; Charles McDonald, Union Bridge Co., Athens, Pa.; Charles M. Jarvis, Berlin Iron Bridge Co., East Berlin, Conn.; Frank Conger, Groton Bridge & Mfg. Co., Groton, N. Y. The secretary is D. O. Morgan and the treasurer, Wm. H. Connell, president of the Edgemoor Bridge Works, Edgemoor, Del.; chief engineer, C. C. Schneider; mechanical engineer, James M. Christy. The board of directors will consist of 21 members, including officers mentioned above. A. C. Case, of the Carnegie Steel Co.'s credit department, and Robert Bacon and C. H. Steele, of J. P. Morgan & Co., New York, are also on the board.

THE Farwell molding machines are the subjects of a special catalogue of the Adams Co., of Dubuque, Ia. In designing this machine the manufacturers were guided by an experience of 15 years in the use of molding machines, in the manufacture of hardware specialties. In 1896 after the company had perfected a line of machines for its own use it began to present them to the trade. Something like 30 illustrations are used in the new catalogue and nearly all are half-tones. The first machine shown, the Farwell molding press, is illustrated in various forms. Its lever is in a horizontal position when pressing the mold, this being the position in which it receives the greatest power with the least exertion by the operator. Some types of the press have a side shelf to hold the match with patterns and flasks, and this may be thrown back out of the way when not in use. The Farwell universal molding machine, which may be used as a combined molding press and stripping plate and as a combined molding press and flask lifter, or as a plain molding press, is described in detail, and the various kinds of work performed are shown, including multiple molds made on a Farwell press with turret top.

THE Lidgerwood Mfg. Co., manufacturer of the Lidgerwood standard hoisting engines and cableways, has removed its Cleveland office, Kaltenbach & Griess sales agents, from 26 South Water st. to the Williamson Building.

THE IRON AND STEEL STOCKS.

Fluctuations of the Week and the Year.

The table below shows the changes in the iron and steel stocks in the week ending May 21, also the high and low points for the year, as reported by Denison, Prior & Co.:

Name.	WEEK.				YEAR.					
	Open	High	Low	Close	High.			Low.		
Am. Car & Fdy.....	16⅞	17	16½	17	18	Feb.	7	12¾	Jan.	15
Am. Car & Fdy pr.	64¾	65¼	64	65½	67⅝	Apr.	2	59	Jan.	29
Am. Steel & Wire,.	37¾	38¼	33¼	34¾	59⅞	Apr.	2	33¼	May	15
AmSteel & Wire pr	77½	78	73	73⅞	95	Feb.	1	73	May	21
Am. Steel Hoop.....	21½	22⅞	20	21½	50½	Feb.	6	20	May	15
Am. Steel Hoop pr	72	72	69	71⅛	86	Feb.	6	69	May	15
Am. Tin Plate.....	25⅛	25⅜	21	24	36½	Feb.	7	21	May	15
Am. Tin Plate pr,.	77	77	74½	75	84¼	Apr.	9	74⅛	May	15
Col. Fuel & Iron...	37¾	37¾	35⅝	37	51⅝	Apr.	2	35½	May	15
Federal Steel.....	38½	39⅛	34½	35⅛	57⅜	Feb.	6	34⅛	May	15
Federal Steel pr....	67	67½	64½	66¾	77⅛	Feb.	6	64½	May	15
National Steel.....	30	31	27¾	28¾	53½	Feb.	6	27¾	May	15
National Steel pr..	88	88	85	87½	97	Feb.	6	85	May	15
Pressed Steel Car..	45½	46	42¼	45⅝	58¾	Jan.	17	42¼	May	16
PressedSteelCar pr	78	78⅜	77	78½	88½	Jan.	17	77	May	16
Republic Steel	15	15¾	14½	15¾	27⅛	Feb.	6	14¼	May	2
Republic Steel pr..	56¼	57	55⅜	56¾	70¾	Feb.	6	52	May	2
Tenn. Coal & Iron	75½	76	68¼	74¾	104	Feb.	2	68¼	May	15

Notes.

Directors of the Republic Iron & Steel Co. meet May 28, to declare the fourth quarterly dividend of 1¾ per cent on the preferred stock. It is expected that a statement will also be made at that time, which officials of the company say will be favorable.

The directors of the National Tube Co., at their meeting May 16, declared a dividend of 1½ per cent on the common stock. This is the first dividend on this issue. The regular quarterly dividend of 1¾ per cent on the preferred stock was also declared.

The American Sheet Steel Co. has filed a certificate at Trenton, N. J., that it has issued $19,000,000 of capital stock, of which $15,000,000 was exchanged for property and $4,000,000 paid in cash.

A meeting of the directors of the Colorado Fuel & Iron Co., will be held in a few days for the purpose of declaring a dividend of 2 per cent on the preferred stock. It is said that a dividend on the common stock will be declared in August.

LAKE SUPERIOR IRON MINES.

The Commonwealth Iron Co. has closed a deal for a lease of the Appleton mine, the Keweenaw association having agreed to the transfer. The work of unwatering the property will begin shortly.

The Commodore mine at Virginia, Minn., now employs about 300 men and is hoping to raise 350,000 tons before Dec. 1. The company is completing a three-compartment shaft south of No. 3, and will soon abandon No. 1 and No. 2. About 150,000 tons are on the surface.

Crerar, Clinch & Co., of Chicago, who operate the Columbia and Mansfield mines, have secured control of the Voos mine on the Menominee range, and will soon start work sinking the shaft deeper and preparing to ship the lean Bessemer ore that is in sight. It has been estimated that there are 30,000 tons of ore that will average about 50 per cent iron and .020 phosphorus now in sight at the property.

The recent cave-in at the Negaunee mine due to an excessive flow of water caused almost a total suspension of operations for a time. There is much ore in the caved-in portion and the company will open a new shaft and drifts if necessary.

At the Loretto mine work has been begun looking to the installation of a large hoisting plant, which is being built at Chicago.

The Sharon Steel Co. will develop as speedily as possible the Brodie mine on the Mesabi range, recently purchased from John T. Jones and associates. The property contains a large body of high grade ore, estimated as high as 15,000,000 tons.

The Republic Iron Co. is preparing to install a new air compressor, but the work will require most of the year.

The recent suit of Wellington R. Burt, of Saginaw, Mich., against the Lake Superior Consolidated Iron Mines, followed formal notice to the company of the cancellation of leases on mining property in the Hibbing district, including a portion of the Lake Superior group of mines. The court is asked to confirm the cancellation, which affects about 1,000 acres of land. The defendants have mined and paid royalty on the full minimum called for in the lease, but the plaintiff complains that they have not taken out as much ore as could have been mined and shipped at a profit.

The Chandler mine, which made an output of 808,359 tons last year, is expected to produce between 500,000 to 600,000 tons this year. Work is now being conducted close to the dividing line between the Chandler and the Pioneer mine, toward which the deposit makes.

At the Michigamme mine 70 men are now working, a night shift having been put on. The upper levels are dry, ready for effective work and a crusher will be set up within another month. At the Imperial and Webster mines in the same district, 125 men are at work, and a force of 200 could be used if available.

PERSONAL.

R. Hedley, of Spennymoor; Henry Crowe, of West Hartlepool; Charles T. Bagley, of Stockton-on-Tees, and S. M. Westgarth, of Middleford, compose the party of British steel experts who arrived at New York last week. They represent the company which has recently been organized in England to erect the largest armor-plate mill in the world, on the river Tees, near Middlesboro. Representatives of this company have also been sent to inspect the Krupp works at Essen and the French mills.

E. Crowther, of Cleveland, O., formerly connected with the Central furnaces of the American Steel & Wire Co., Cleveland, has been engaged to take charge of the new open-hearth plant and blast furnace of the Hamilton Iron & Steel Co., Hamilton, Ont.

Benjamin C. Lauth, furnace builder, of Pittsburg, has just returned from a European trip.

W. I. Babcock, president and general manager of the Chicago Shipbuilding Co., has resigned, and on July 1 he will quit the lakes definitely. He has said nothing of plans for the future. He is probably not in a hurry to settle anywhere. In all the large industrial consolidations that have taken place of late big men in the different companies entering into these consolidations have disagreed. Nothing is said on this score in Mr. Babcock's case, but the cause of his resignation could undoubtedly be traced back to disagreements beginning with the organization of the American Shipbuilding Co.—[Marine Review.

The following Americans were elected to membership in the Iron and Steel Institute at the recent London meeting: Holbrook F. J. Porter, Bethlehem Steel Co., South Bethlehem, Pa.; P. C. Patterson, National Tube Co., McKeesport, Pa.; Simon S. Martin, Sparrow's Point, Md.; Albert Ladd Colby, Bethlehem Steel Co., South Bethlehem, Pa.; Edmund E. Johnston, Ashland, Wis.; John S. Kennedy, Stanhope, N. J.

Arthur W. Brown was given a silver loving cup by the employes of the Cambridge (O.) Iron & Steel Co. on his recent retirement from the management of the plant.

James J. Hemphill, the famous engine builder, and a member of the firm of Macintosh, Hemphill & Co., Pittsburg, is lying critically ill at his home in Pittsburg. He is suffering from neuritis and is partly paralyzed. Owing to his advanced age there is no great hope of recovery.

R. D. Carver has been appointed general sales agent of the Alabama Steel & Wire Co., Birmingham, Ala. For a number of years he was secretary of the Cincinnati Barb Fence Co., and when that company was absorbed by the American Steel & Wire Co., became attached to the sales department at Chicago. His headquarters will be at Birmingham.

W. H. Nelson is manager of the Manistique Iron Co.'s charcoal iron furnace at Manistique, Mich., which went into blast on May 17.

W. E. Corey, superintendent of the Homestead Steel Works of the Carnegie Steel Co., has been placed in control of the Carrie blast furnace plant of the Carnegie Steel Co. at Rankin. He will hereafter supervise the two plants. The Carrie plant is located across the river from the great steel works.

Andrew Carnegie, it was announced at the meeting of the Iron and Steel Institute in London two weeks ago, will give a scholarship and medal to be bestowed as the members may direct.

THE IRON TRADE REVIEW
AND
INDUSTRIAL WORLD.

DEVOTED TO MACHINERY, METAL-WORKING AND FOUNDRY TRADES AND IRON AND STEEL MANUFACTURE.

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A GREAT IMPETUS TO ARBITRATION.

The details of the settlement arrived at by the arbitration board of the National Metal Trades Association and the National Association of Machinists, at New York last week, are given elsewhere in this issue. It is probable that comparatively few employers in the metal working industry, and certain that few in iron manufacture, appreciated how much was staked on the result of this conference. Had there been a disagreement a great strike would have been on to-day in the machinery trade throughout the country. What such a conflict, stubbornly and bitterly waged as it would have been, would have cost iron manufacturers, though not directly involved, can only be guessed. With machine shops stopped many foundries would have closed, pig iron consumption would have been cut down, and mills, forges and boiler works, to say nothing of the machinery supply trade, would have suffered a considerable shortening of business.

Not only have these possibilities been averted, but the New York conference, because of the vast stake involved, becomes conspicuous testimony to the value of arbitration, and helps to fix it as an institution in American industry. There have been arbitrations and friendly conferences in the adjustment of labor disputes, but we recall none in which the direct interests were so large or so varied and the collateral interests so important. It is hard to estimate the good done by this settlement in furthering conciliation in the handling of labor questions and in presenting an object lesson to the radical spirits found on both sides of the industrial field.

Doubtless a hindrance encountered in the ranks of employers was the unwillingness of some to take any step that might be construed as "recognition of the union." There is recognition and recognition. Recognizing the existence of an institution is quite different from the recognition involved in submission to the tyrannies sometimes practiced under union control. The manufacturer who objects to a conference with a union committee because none of its members are his employees forgets that representation by an attorney is not a new procedure; that manufacturers are in the habit of employing attorneys and that the right can scarcely be denied to employes, who elect to have their grievances presented through a chosen mouth-piece. Moreover, those employers who feared that such conferences as that at New York would involve yielding the whole question of union recognition have found that their conferees and the association back of them have stood like a wall for the principle that the employer is master of his shop and that he alone is to judge of the competence of employees.

The employers' representation on the arbitration board was especially strong because composed of machinists. On the other side were men who had worked as machinists for 20 years but had left the shop to conduct the affairs of their union. The three employers had worked as journeymen machinists for 10 years or over; consequently there was not a detail or a term belonging to the minutiæ of shop practice with which they were not thoroughly familiar, and they met every argument of the union representatives from the standpoint of actual experience in the ranks. Another noteworthy feature of the arbitration was that both committees kept in close contact throughout the sittings, which lasted from May 10 to May 18, with representatives of their respective organizations. The machinists' arbitrators had by wire and telephone the advice of officers of their local organizations throughout the country. The arbitrating employers had with them as an advisory board the administrative council of the National Metal Trades Association, and other members of the organization. At every recess or adjournment each commitee at once met with its advisory representatives for discussion of the question pending.

It means much for the general acceptance and the permanency of the agreement between the employers and journeymen machinists, that substantial concessions were made on both sides. As was done in the printers' trade last year, the demand for an immediate shortening of hours was compromised by a term arrangement, which gives half the demand in six months and the balance in a year, giving time for an adjustment to the new basis of cost. The vital point of all, however, is that the machinists have recognized the justice of the employers' contention that if a minimum wage is fixed, there must be a definition of the minimum equipment of skill and ability to expedite work, which the employe must have to entitle him to the minimum wage. The Iron Molders' Union will now have less ground than ever for its demand for a minimum wage without any stipulation as to minimum fitness or performance.

But the New York agreement is important, less for what it actually provides in detail for the settlement of pending questions, than for the fact that it has established the principle of national arbtiration in a great trade, embracing widely diversified establishments, operating under greatly differing condi-

tions. It is in some respects the most monumental achievement in our recent industrial history.

IMPORTANT DEVELOPMENT IN STEEL-MAKING.

Benjamin Talbot, of the Pencoyd Iron Works, Pencoyd, Pa., and Ambrose Monell, of the Homestead Steel Works, presented two of the most important papers ever read before the Iron and Steel Institute, at its recent meeting in London. The former dealt with the process which bears Mr. Talbot's name, and which provides for continuous manufacture of steel in the open-hearth furnace, giving tonnage and economy impossible heretofore. Mr. Monell's paper claimed for the "pig and ore" process which has been developed at Homestead some improvements over the Talbot process. Briefly it consists in charging in a basic open-hearth furnace limestone and a relatively large quantity of ore, heating these and then charging molten pig metal taken from a mixer or direct from the blast furnace. It enables the manufacturer, if he so desires, to dispense with steel scrap or greatly to reduce the percentage of scrap in his charge; and it enables the process with the use of pig and ore to be carried on as rapidly and economically, and with as great an output per furnace, as with a charge containing 50 per cent of scrap.

It is significant that these two papers, presented at the same meeting of the leading body in the world dealing with the technology of iron and steel, should have come from the United States; and the fact seems to have been appreciated by the metallurgists who listened to them that they were the advance note of a possible revolution in steel making. The relatively small output of the open-hearth furnace as compared with the Bessemer converter has made its development slower; but now that it promises to be put on so greatly improved a footing commercially, no limit need be set to its expansion in the comparatively near future. Taken in connection with the known limitations on the Bessemer ore supply in the United States, these new developments are of utmost importance.

It is well known that the Pencoyd Iron Works have built one 75-ton open-hearth furnace, using the Talbot process, and has a still larger one under way. At the London meeting referred to, Mr. Graham Frazer, of the New Glasgow Steel Works, Nova Scotia, stated that his company had made arrangements to build a Talbot furnace of somewhat smaller capacity. Referring to these facts the *Iron and Coal Trades Review* makes the following interesting comment:

> The new system has therefore passed beyond the merely experimental stage. It may, in short, be regarded in principle at least, as a process of the future. Let us briefly consider what this fact means. The object aimed at by the author is to develop a process which, while giving the continuous production of the Bessemer, should also give the yield of the open-hearth system. In pursuit of this object, he found that he could use liquid metal without destroying the hearth, and that he could use any grade of metal, secure the fluidity of both metal and slag, and promote rapid chemical action, by maintaining a large bath of molten metal in the furnace. The continuous process enables the mills to be kept regularly supplied with ingots, which they are not at present; it enables scrap to be dispensed with, and pig and ore exclusively to be used; it enables the average yield to be raised to 105; it enables the weight of the cast metal to be regulated in accordance with the requirements of the mills; it involves a great economy of metal and fuel; and it facilitates larger outputs. These are advantages of such obvious importance that no steel manufacturer can afford to disregard them, whether he now follows the Bessemer or the open-hearth method.
>
> At the same time, it must not be hastily assumed that the Talbot or any similar process is necessarily about to take the steel making world by storm. In the majority of cases, open-hearth steel manufacturers have within recent years expended large sums of money on their melting plants in the transition from furnaces of 10 tons to 50 tons capacity. Their present plants, as a rule, are sufficient for all ordinary requirements, and are well up-to-date. The same remark is not equally true of all Bessemer plants, and we are disposed to believe that the new process, where it achieves conquests at all, is more likely to make them in the Bessemer than in the open-hearth field. We have reason to believe that the new process would represent an economy of perhaps 10s. per ton in the wastage of the Bessemer process of today, and the announcement of its economy seems to have almost sounded the knell of pneumatic steel-making. At the same time, the Talbot process does not stand alone. The paper by Mr. Ambrose Monell, deals with a rival process communicated at the same meeting, whereby, at an early stage of the heat, the phosphorus is eliminated at a low temperature, and the slag with its impurities being thus removed the bath can be heated rapidly and the carbon brought down to the desired point with such unusual rapidity that, using only pig and ore, some 650 to 700 tons of steel per week can be produced from an ordinary 40-ton open-hearth furnace. This other process has been taken up by the Carnegie Steel Co., which is a pretty safe indication that it is deserving of attention. It claims to turn out a larger yield in an unusually short space of time, and more completely to eliminate phosphorus than the Talbot system. We shall not attempt to decide between the two systems. It is perhaps as yet too early for any one to do so. But it is evident that we are on the eve of great changes in steel-making practice, and it may easily be that the typical steel-melting furnace of the future will be one that can deal with a charge of 200 or 250 tons at a time, instead of 20 to 50 tons as at present.

New Car Wheel Company.

The Keystone Car Wheel Co., of Pittsburg, will apply for a Pennsylvania charter on June 7. The capitalization is $200,000. The incorporators are Charles V. Slocum, formerly with the Pennsylvania Car Wheel Co., William L. Elkins, William W. Lobdell, Louis B. Whitney, Charles A. Otis, Jr., N. Holmes, John G. Holmes, A. J. Bliss, John Demerly Martin Schunk and L. F. Slocum. A site of 10 acres has been purchased near Homestead. The main building will be 300x110 feet.

THE Champion Iron & Steel Co. of Muskegon, Mich., has opened a sales office at 1218-1219 Marquette Bldg., Chicago, under the management of Thomas S. Gordon, sales agent. The company, which at present makes open-hearth ingots, billets and bars and merchant bar iron and steel, is building a tin plate plant, and will have four mills in operation the first week in June. Four other mills are building, and will be put in operation later.

THE Dillon-Griswold Wire Co., of Sterling, Ill., voluntarily gave its wire drawers an advance of 10 per cent taking effect May 14.

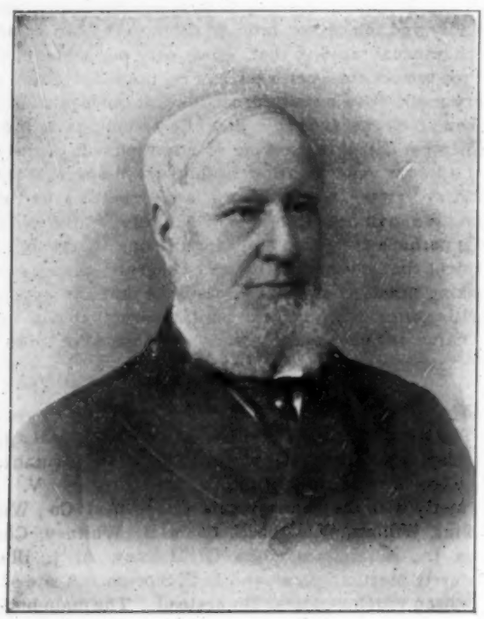
THE Webster Foundry Sand Co., has moved its offices from the Crozer Building, to Pier 41, north wharves, Philadelphia, where it has greatly increased its facilities for handling material. The company deals extensively in genuine Lumberton sands and is one of the largest houses in the country in its specialty. It also handles pulverized fire clay, silica sand and all lines of like materials used in brass and iron foundries. Its trade has been greatly extended in the past year.

THE Cramp Ontario Steel Co. has filed incorporation articles at Toronto. The capital stock is placed at $5,000,000, divided into shares of $100 each. Among the incorporators are Charles D. Cramp and William N. Cramp, of William Cramp & Sons' Ship & Engine Building Co., of Philadelphia.

A STEEL MASTER'S NOTABLE CAREER.

Mr. and Mrs. Benjamin Franklin Jones celebrated the 50th anniversary of their marriage at their home in Allegheny, Pa., Monday evening, May 21. A reception attended by more than 300 guests was given in honor of the event and cordial congratulations were extended by friends who stand uppermost in the social and industrial worlds of Western Pennsylvania. A foremost figure among the manufacturers of Pittsburg, Mr. Jones further bears the distinction of being the oldest active iron master in Western Pennsylvania. To his efforts is largely due the success of the great industry known as the American Iron & Steel Works, of which he has been so long the head. It has been the lot of no other member of the trade to be identified for more than half a century in a responsible directing capacity, with the wonderful development of the American iron trade. To have built up a business that has been practically an uninterrupted expansion from the beginning, through all the vicissitudes of the past 50 years, and to have seen and to have been largely instrumental in the splendid growth the Jones & Laughlins interests have had in the closing years of the century, is a distinction that may well be regarded as monumental.

His life has been one of great activity. He was born at Claysville, Washington county, Pa., Aug. 8, 1824, thus making him 76 years of age. At the age of 13 he removed with his parents to New Brighton, Pa., where he received a good academic education and at the age of 19 he left home and removed to Pittsburg to begin his business career. He was first employed as assistant shipping clerk at no salary, of the Mechanics' line of canal boats but later when the independent line of section boats was started Mr. Jones, when only 21, became manager of this as well as the Mechanics' line. In 1847 he became a partner in the Independent line, which was operated until 1854, and then traffic by canal was superseded by rail. As early as 1846 he purchased a part interest in a furnace and forges near Armagh, in Westmoreland county. In 1851 he took an interest in the American Iron Works, with which he has since been identified. The works were then being built by Bernard Lauth, and the firm was known as Jones, Lauth & Co. In 1854 James Laughlin came into the firm, and upon the retirement of Mr. Lauth, in 1857, the firm name was changed to Jones & Laughlin. Outside of the death of partners, no changes in interests have taken place since that date.



BENJAMIN F. JONES.

Although a very busy man Mr. Jones never lost sight of public affairs and in 1884 he was made a member of the Republican National Committee, being its chairman in the arduous and critical campaign of that year. The American Iron and Steel Association in 1885 elected him its president to succeed Daniel J. Morrell. On May 21, 1850, Mr. Jones married Miss Mary McMasters, daughter of John McMasters, Sr., of Tuttle Creek, one of the best known citizens of Allegheny county. Mr. and Mrs. Jones have three daughters, Mrs. Alexander Laughlin, Jr., Mrs. Elizabeth M. Horne and Mrs. William Walter Willock. Benjamin F. Jones Jr., manager of Jones & Laughlins, Ltd., is the only son.

A MODERN ENGINEERING SUITE.

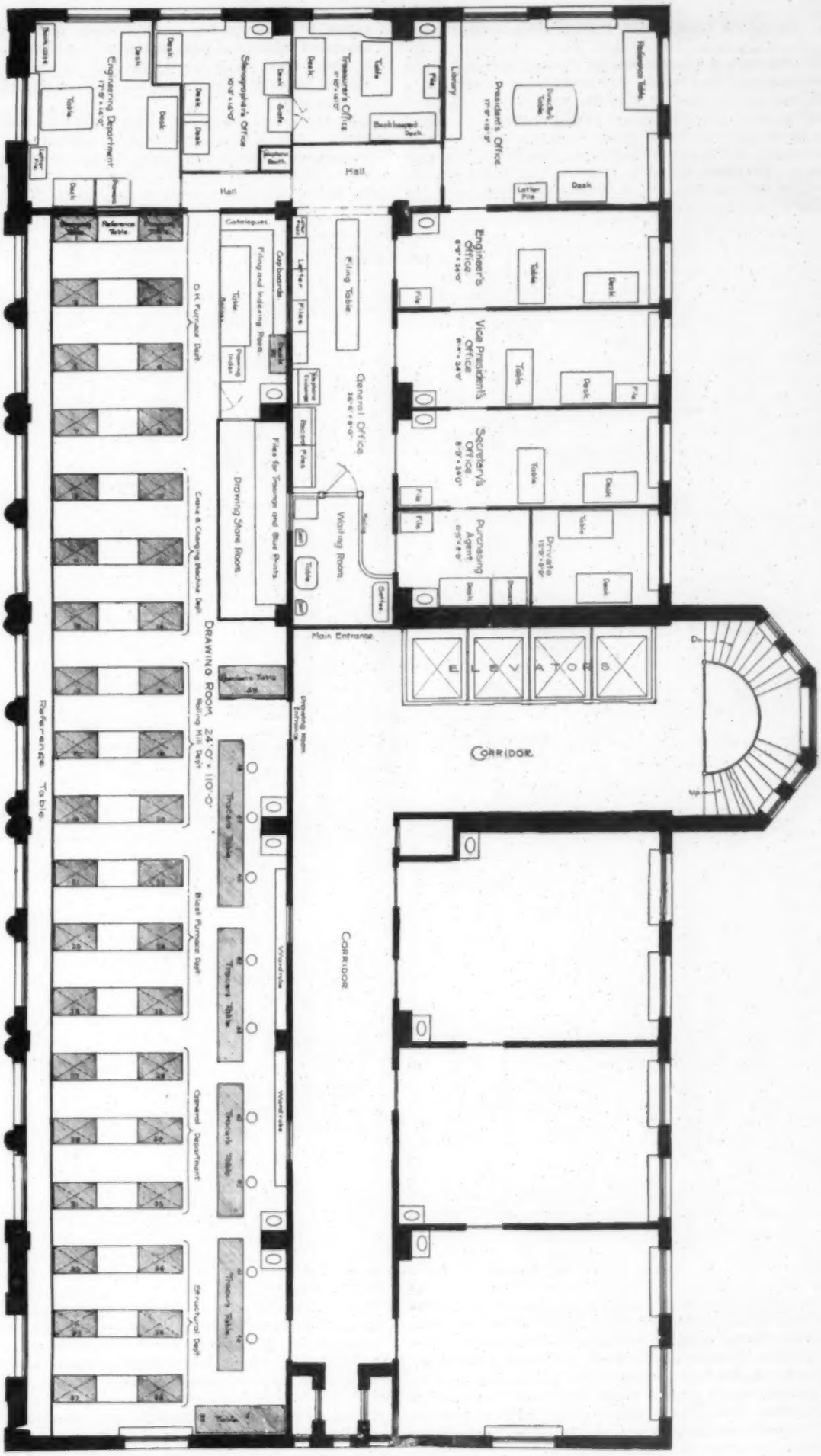
A rearrangement has just been made of the engineering offices of the Wellman Seaver Engineering Co. on the 14th floor of the New England Bldg., Cleveland. So rapid has been the growth of this firm's operations that it now requires for its consulting and draughting departments almost the entire floor of the building named. The recent rearrangement puts the executive offices all on one side of the corridor, while the drawing room, including the head draughtsman's office, extends the full length of the building. As the accompanying plan view shows, there is now room to work 48 draughtsmen comfortably, besides a considerable force of stenographers and clerks. More draughtsmen could be provided for if necessary.

Visitors come first into a small vestibule divided off from the general office by a low railing. The purchasing department being most sought come first in the line of offices. It is divided into two rooms, the outer room being used by the purchasing agent's assistant and stenographer. Next in turn come the secretary's, the vice-president's and engineer's offices, each being lighted by a large window giving a view of Lake Erie. The president's room is in the corner of the building, so located that it is convenient of access to the executive offices and the corridor. The general business of the company is transacted in the president's room and it is the place of official meetings. The treasurer's office adjoins that of the president and beyond the treasurer's room is that of the stenographers.

The entire Euclid avenue front is given up to the draughting department, the head draughtsman's office being in the corner and in the same room the desks of his assistants. The drawing room, into which the head draughtsman can look through a large window is exceptionally well lighted, the front being nearly all windows. In addition each drawing table is provided with an independent and adjustable incandescent lamp. There are 38 improved drawing tables, so arranged that each draughtsman has an independent table fitted with a drawing board adjustable at any angle and conveniently raised and lowered. Each has also a reference table and underneath the drawing table small drawers to contain individual effects. Under the reference tables are large drawers to contain the drawings upon which work is being done. The draughtsmen, as will be seen from the plan, are grouped together in departments, each under a foreman from whom orders are given. The foremen in turn report to the head draughtsman. A large force of men can be concentrated on a single piece of work and necessary drawings and other information can be furnished very rapidly.

In addition to the tables for the 38 draughtsmen there are separate tables for tracers and checkers. At the end of the drawing room adjoining the head draughtsman's office is the drawing storeroom which is cut off from the drawing room by means of a clear glass partition. Here are 150 drawers of proper size to store 100 consecutively numbered tracings each, making a total storage capacity at present of 15,000 drawings. Only one man has access to the drawings and a careful record is kept of every tracing and blue print sent out. Next to the drawing storeroom is a filing and indexing room in which are placed the records of the business. The records and drawings are all catalogued by the card system, and any information regarding any document can be furnished immediately.

THE Edw. P. Allis Co., of Milwaukee, conducts well-appointed mining machinery departments in connection with its New York and Chicago offices. Users of mining machinery can be served from the company's New York office, 95 Liberty st., or the Chicago office, 509 Home Insurance Bldg., with the same efficiency as from the Milwaukee office.



A MODERN ENGINEERING SUITE—OFFICES OF THE WELLMAN-SEAVER ENGINEERING CO., NEW ENGLAND BUILDING, CLEVELAND.

BUCKEYE ENGINE CO.'S BLOWING ENGINE.

We illustrate a blowing engine recently installed at the blast furnace of the Cherry Valley Iron Co., at Leetonia, O., and built by the Buckeye Engine Co., of Salem, O. The machine is of the steeple type, having blowing tubs above the steam cylinders. It is cross-compound and is operated condensing, being equipped with a Wheeler surface condenser. The steam cylinders are 40 and 75 inches in diameter; the blowing tubs are 78 inches in diameter, and the stroke of all cylinders is 54 inches.

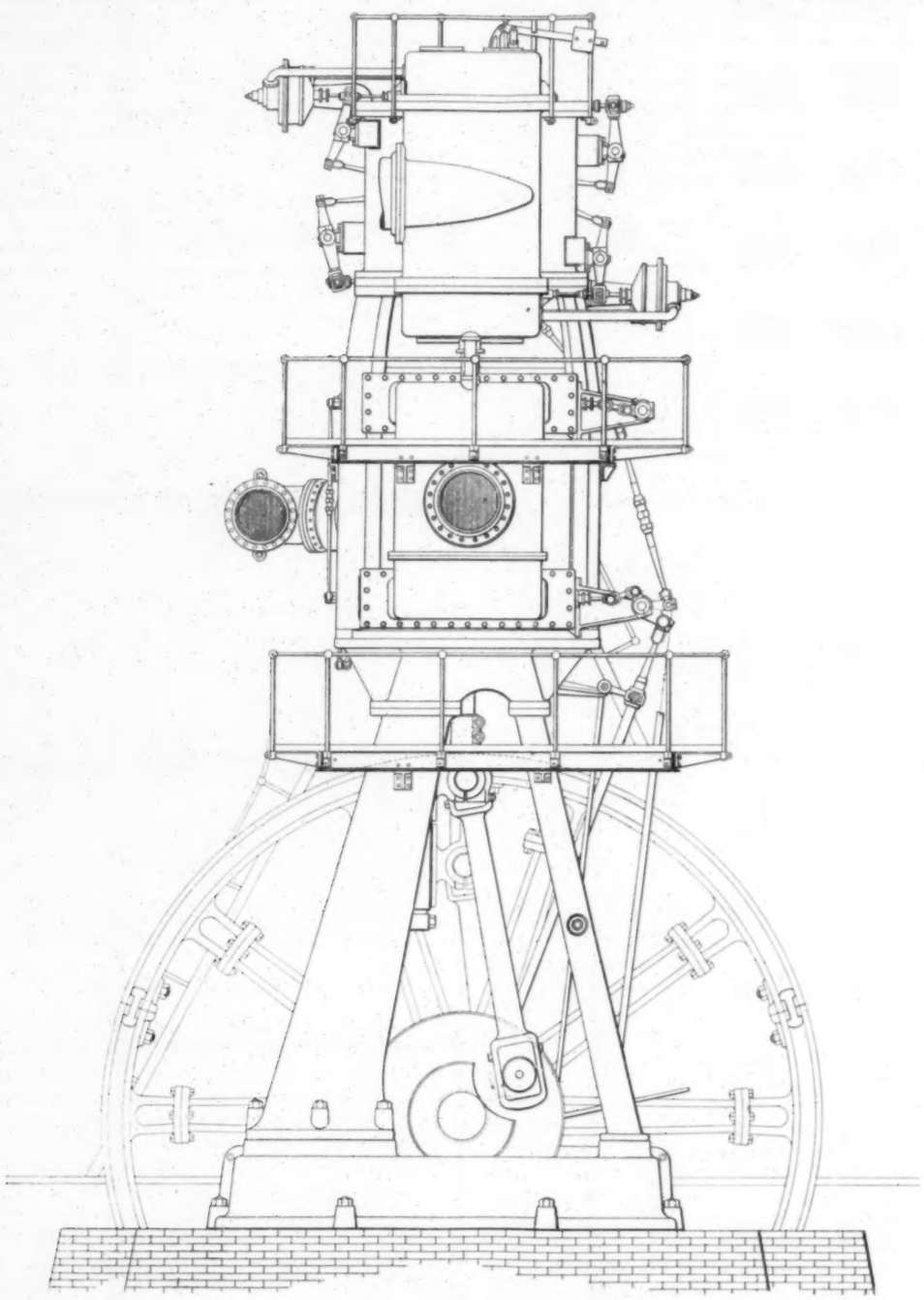


FIG. 1.—BUCKEYE ENGINE CO.'S BLOWING ENGINE. END VIEW.

The high pressure steam cylinder is equipped with round or piston valves, the cut-off valve riding within the main valve, and being operated on by the governor, which is a ball governor running at four times the speed of the engine and acting on the high pressure cut-off eccentric only. The low pressure steam cylinder is equipped with four gridiron valves, steam and exhaust valves being separate, and the steam valves carry independent cut-off valves operated by an adjustable eccentric. Fig. 1 gives an end view of the engine and Fig. 2 a side view. The construction of the steam valves is shown in Fig. 3. It is such that the motion of the cut-off valves is at right angles to that of the main valve in which they ride, which insures that the extent of movement of both valves is always the same in amount, causing uniform wear.

The air valves are gridiron plates made of steel for lightness. They are actuated through ordinary wrist plate mechanism, except in the opening movement of the delivery valves, which is accomplished by means of air cylinders having pistons attached directly to the valves. These pistons are 21 inches in diameter, and are cushioned at each end of their movement so that although the opening is quick it is not accompanied by any unpleasant jar. The engine is at present running at 26 to 28 revolutions per minute, delivering air at 8 to 9 pounds, but is designed for higher duty. The total weight is about 600,000 pounds.

The American Steel & Wire Co., will introduce the check system of paying its employes at its Braddock and Rankin, Pa., plants. This method has been in vogue for some time at other plants of the company and has proved satisfactory.

ELECTRICITY IN FACTORIES AND MILLS.*

BY WM. S. ALDRICH, CHAMPAIGN, ILL.

The recent progress in the use of electricity for the transmission of power over short distances has developed a new industry. It bids fair to rival in magnitude and usefulness the field of long distance transmission, much earlier developed, and now almost exclusively held by electricity. As applied to factories and mills electricity is simply a means to an end, which is primarily the transmission of power over quite short distances, from 50 to 500 feet, and within one building or a group of buildings. Some manufacturers have hoped that electricity would solve all of the problems, and at once, upon its introduction into their establishments; others have known it would be of no use from the beginning. There are many factories and mills in which the introduction of electricity for power transmission will not pay, under existing conditiosn; there are more establishments in which it would pay, in which an investment in electric transmission would prove to be a dividend-paying investment. No general rules can be laid down. Each case must be carefully examined, and a most thorough preliminary survey made of all the conditions and requirements. In minor ways, electricity has proven to be a very useful servant to have around in manufacturing work, not only for lighting the establishment, but for many lines of work requiring small but easily controlled heat supply. Certain small industries have been completely revolutionized, and new lines of manufacturing work made feasible and profitable, by the use of electricity.

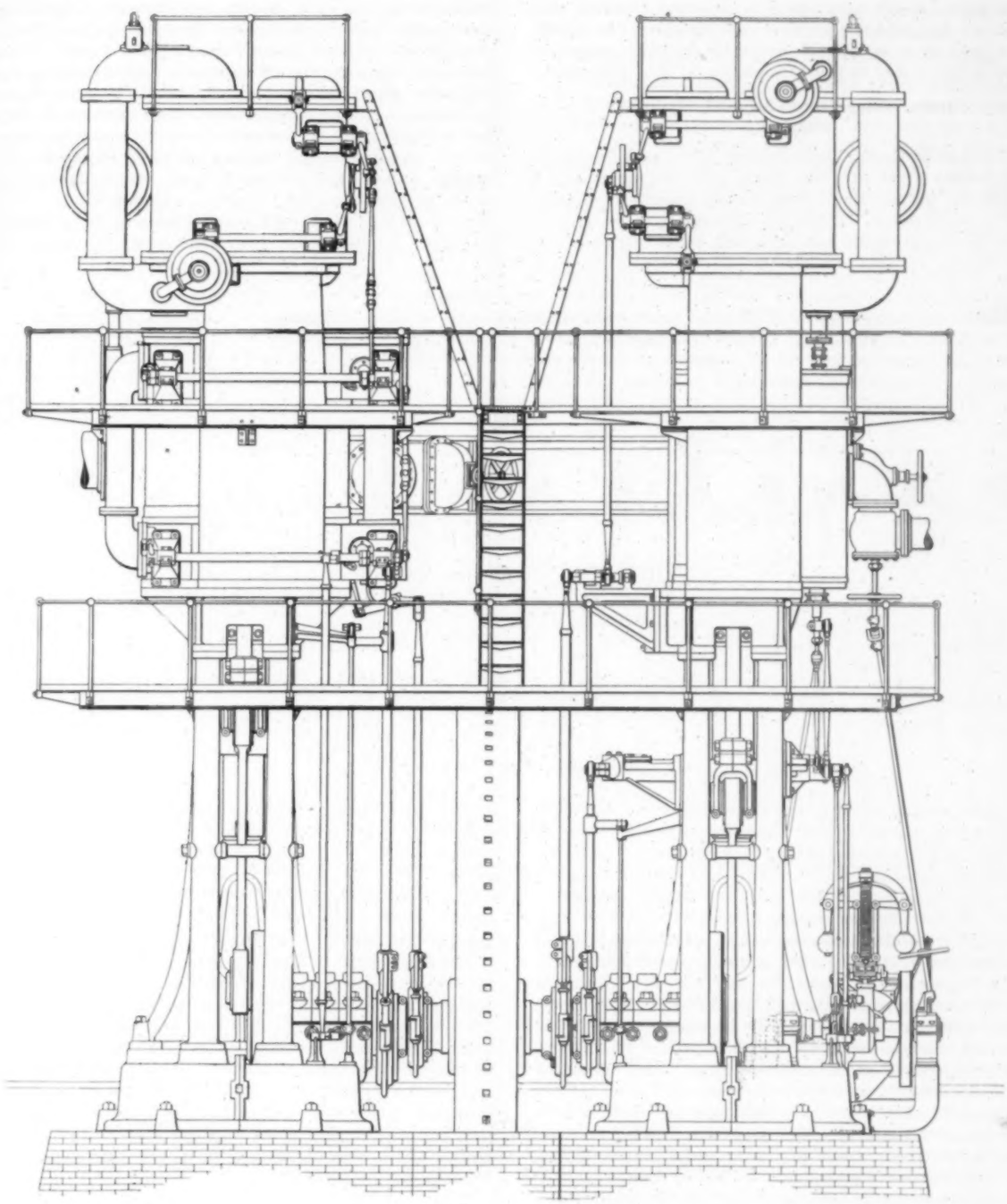


FIG. 2.—SIDE VIEW OF BLOWING ENGINE.

Each year more and more machinery is thrown into the scrap heap to make room for new and improved types, yet antiquated and costly methods of transmitting power are left in service. Modern methods of workshop production, in which machine tools are worked up to the power limit, are seen to be sought after, side by side with belted transmission of power, which makes it quite impossible to realize fully the value of the new method, by not giving the operator the utmost freedom of speed control of machine and tool. Elec

*Extracts from a paper read at the Cincinnati meeting of the American Society of Mechanical Engineers.

tric-motor drives provide suitable and quickly adjusted speed ranges under all of the ordinary starting loads of workshop appliances. This has resulted in increasing the output from 10 to 80 per cent compared with the old and fixed speed conditions with belts and gears. Electric measuring instruments, such as ammeters and wattmeters, used in connection with the motors operating each machine or a small group of machines, have shown this method of transmission to result in a saving of from 20 to 30 per cent of the power required by the old method. The electric motor is in operation and consuming energy only when needed. It is ready for instant service under any change of conditions of speed or power required by the work. It will meet easily 50 per cent overload, and maintain it for half a day or till the whistle blows. It admits of the readiest expansion of workshop facilities, and machines so driven may be placed anywhere to best advantage.

Electric, Steam, Compressed Air and Hydraulic Transmission.

The system of electric transmission for a manufacturing establishment is the only one which admits of economically centralizing the so-called "mechanical plant" supplyipng light, heat and power. It is a great advantage to be able to locate the power house near coal and water supplies. In some cases it thereby allows the use of condensing engines instead of non-condensing. By adopting electric transmission the engine may be located at any convenient distance from the machines, while shafting transmission inperatively requires that it be located as near by as possible.

If steam power is converted into electricity for all the mechanical operation of a manufacturing establishment, it admits of a subdivision of the generating plant into duplicate and interchangeable units, the advantages of which will be apparent. The generating plant may be operated at all times in such a manner that each engine is loaded to its normal capacity. One or more units may be held in reserve for rush work and heavy orders. Night shifts can be supplied with power in units suited to their work, rather than requiring the usual single large engine to be operated as in the ordinary day shift. Nearly uniform loads may be maintained on the engines, both day and night, the electric load at night offsetting additional electric-motor service during the day.

In some cases it may be found necessary or desirable to have a mixed system of steam and electric distribution, but it can be obviated, with increased economy, by judicious installation. The use of small steam engines about an establishment, for any purpose whatever, is to be deprecated. The maximum economy today is to be obtained by centralized power generation.

There are, of course, certain operations in manufacturing work best performed by compressed air, while others are best performed by hydraulic pressure. Electricity does not enter these special fields. Compressed air and hydraulic pressure provide means for performing work by the more or less direct application of the energy distributed by these fluids. They would not be seriously considered as suitable systems for general power transmission for such short distances as are required in factories and mills. For all manufacturing operations (except the very lightest) requiring rotary motion, continuous or intermittent, uniform or variable, and reversible or otherwise, electric motors provide the readiest facilities. For certain very definite reciprocating movements, with fixed time or distance limits, hydraulic mechanism are best suited, though electric-motor driven hydraulic mechanism with hydraulic control have proven admirably adapted to this class of work. For reciprocating movements requiring a cushioning effect, compressed air is best adapted. But for efficient service in any case compressed air requires to be reheated and used expansively in a cylinder with all parts and mechanisms practically the same as in the steam engine. Electric transmission is equally adapted for all of the so-called auxiliary machinery of a manufacturing establishment, the non-productive machinery,

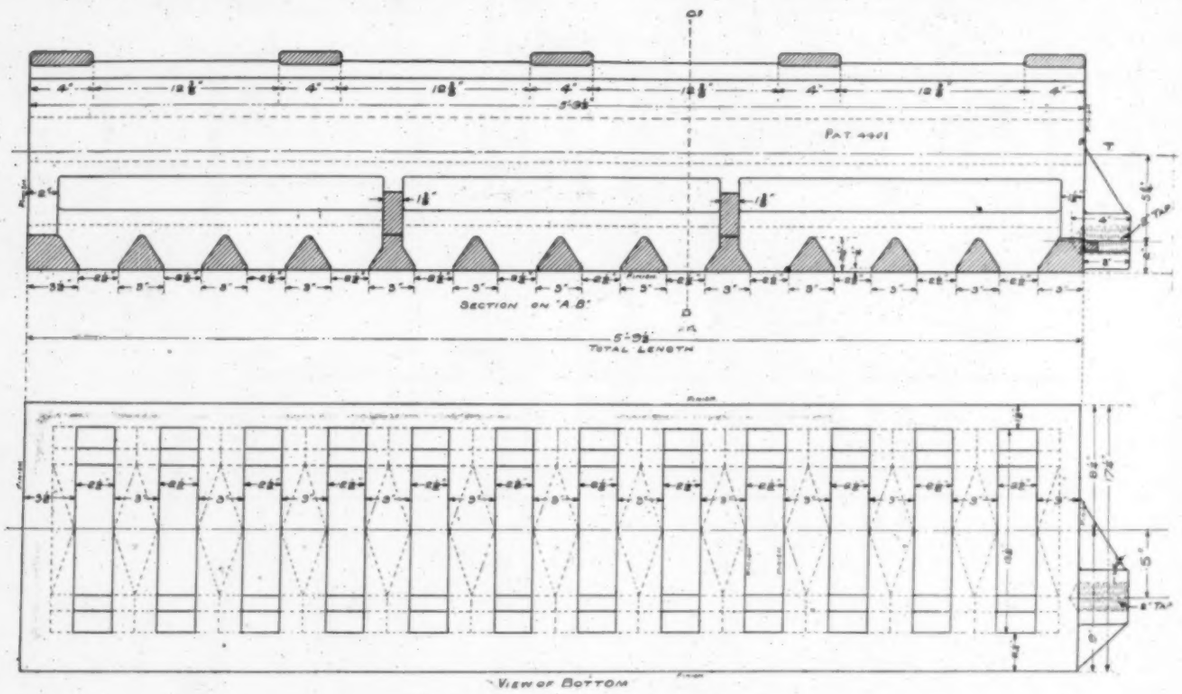


FIG. 3.—STEAM VALVE OF BLOWING ENGINE.

pumps, compressors, fans, blowers, cranes, hoists, lifts, etc.

The introduction of electric transmission has been greatly facilitated by the recent standardization of electrical machinery, and especially that required for power purposes. This, furthermore, facilitates repairs and renewals, if it were necessary to advance this as an argument in favor of electricity. Fortunately, electric machinery as made today requires the simplest moving parts and the fewest repairs and renewals. Many motors have been in constant service for over six months, and have required only a supply of oil. Others have been in service for years, with renewals of brushes only required.

Systems of Electric Distribution for Factories.

In choosing a system of electric transmission far manufacturing work, it is not necessarily best to have that one system which will the most readily lend itself to all the work to be performed, for light, heat, and power service. A composite system may prove best suited, even in such short-distance transmission. That is, lighting service will, in general, be more satisfactory, and need not be more expensive, if supplied independently of the power service. Direct and alternating currents are equally adapted for factory transmission, and by simple or multi-circuit systems of distribution; that is, by two, three, or four-wire systems, as the

case may require. Preferably, all distribution should be direct; that is without the use of storage batteries, rotary converters, or transformers except for certain lines of work in which it may be necessary to use one or the other of these indirect systems of distribution.

In the matter of voltages a wide range is possible: 110-volt two-wire and 220 volt three-wire systems for use of either direct or alternating currents for light and power; 440-volt, two-phase alternating-current three or four-wire systems for both light and power; 550-volt direct-current two-wire system, or 550-volt alternating-current, three-phase, three-wire system, chiefly for power service, or the monocycle system for both light and power. In general, it will not be necessary nor advisable to use over 550 volts, direct or alternating current. Shocks arising from accidental contact with wires carrying currents of this voltage are not necessarily dangerous. Experience has shown that workmen respect the distributing wires the higher the voltage. But it is not necessary to commend such respect by raising it above 550 volts.

Electric Transmission by Direct Currents.

At the time that electricity was introduced into manufacturing establishments the direct-current system was the only one available. For the peculiar and exacting service required in driving all kinds of machine tools and various workshop appliances, there were difficulties to be overcome with any system. It was necessary to secure satisfactory methods of producing a larger starting turning moment, or torque, for varying the speeds as might be required under uniform or variable loads, and for reducing to a minimum the trouble arising from the use of a commutator.

electric motor receives in a factory, a commutator may become in less than an hour so dirty as to result in considerable heating, due to increased mechanical friction of the carbon brushes, and to the increased current required by their imperfect contact. Dust-proof casings remove several of these possibilities to a more remote time. But somehow workmen expect an electric motor to take care of itself, at least they treat it on this assumption. If a motor were sure of the daily care and inspection formerly bestowed upon shafting and belting, it would have made a much better record earlier in its history. Electric motors cannot usually be similarly inspected and attended to while at work as in the case of the older system of mechanical transmission. To have such work performed at any time requires a skilled attendant.

Electric Transmission by Alternating Currrents.

The alternating-current system, with its induction motor service offered practically the only alternative to those engineers and manufacturers who did not care to be troubled with the petty annoyances and delays likely to occur at any time with the dierct-current motor. The induction machine as it stands today is probably the most perfect motor yet developed from the standpoint of electric transmission in factories and mills. It may be started and operated from any point, at any time, at practically any load and speed within its predetermined ranges. It may be used on 110, 220, 440 or 550-volt alternating current circuits of one, two or three-phases. It does not require any direct current supply as the synchronous motor does for its field excitation. It does not require any brushes, commutator or collecting rings. Offsetting these advantages, however, are certain

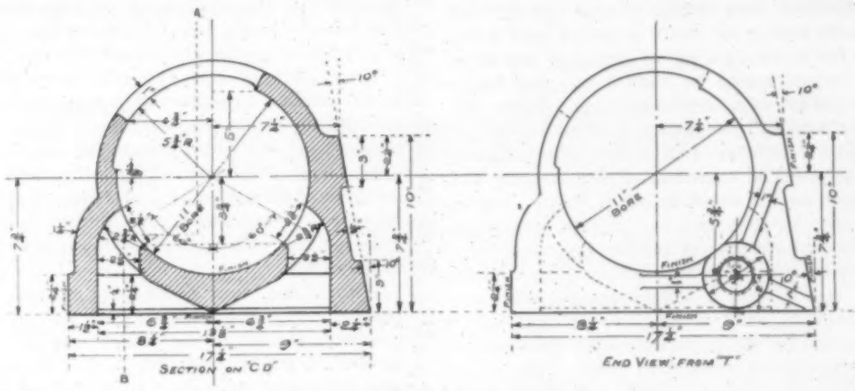


FIG. 4.—MAIN VALVE IN SECTION.

With direct-current motors, it was a simple matter to introduce starting boxes (resistances) in the armature circuit to control the torque, as well as rheostats (resistances) in the fields to control the speed in particular. But every such resistance meant an expenditure of energy in otherwise useless heating of the wire or other material of which these resistances might be made. The so-called Ward Leonard system came to the rescue with its two additional machines in order to operate the one given machine as a motor, at practically a constant efficiency under all conditions of load and speed. This system has been very successfully and extensively used in elevators, cranes, etc. By the use of the auxiliary machines the supply voltage may be varied according to the speed desired, and the current supplied according to the torque required, without wasting any energy in heating wasteful resistances. For conditions of factory service permitting of such an application, two motors may be advantageously used on one machine or set of machines, by means of which it is possible to vary the torque and speed quite as satisfactorily as in street-car working, by the series-parallel method of control.

The difficulties with commutators have been almost entirely overcome, and many refinements in design effected so that the direct-current motor of today leaves little to be desired. Such objectionable features as still remain are inherent in the direct-current system used, and are found to lie chiefly in the kind of armature, commutator and brush devices required. These parts are most liable to derangement, require systematic attention for cleanliness and efficency and renewals of brushes. In heavy work, with the ordinary rough usage which an

restrictions. The speed of an induction motor falls off slightly as the load is increased. This is shown in Fig 4, in which the per cent of such change of speed is laid off at the bottom, and is known as the slip. The ability to start an induction from rest under a heavy load, as well as the possible speed changes during its operation, are obtained at some sacrifice of efficiency.

Induction motors, moreover, permit of higher lineal speeds than are possible with any other type, from 6,000 to 7,000 feet not being infrequent. By suitable arrangements of its field windings, this type of motor may have its speed altered in regular steps, so reducing it one-half, one-quarter, one-eighth, etc. This makes possible similar changes to gear-wheel combinations, which may therefore be eliminated to the extent that the induction motor is installed to effect such changes. In almost all cases of shop driving, the slip is not objectionable, any more than the increasing slip of the driving belt as the load is thrown on. These motors will stand almost any amount of rough usage and heavy overloads, as they cannot be burned out. If excessively overloaded, the motor slows down and stops, starting up immediately as soon as the load is lightened. Ordinarily, machine tools and almost all classes of shop machinery are started at quite light loads, and the full load is thrown on when the work or the tool is up to the speed desired. For this class of work the induction motor seems specially fitted. A larger generating power plant is required for an installation of induction motors than would be the case if direct-current motors were used. This is on account of the enegry which is lost in all classes of alternating current circuits in which there is con-

siderable self-induction, whether in the transmission wires, or in the appliances used. In the case of induction motors this loss is very appreciable at light loads, becoming much reduced at average and heavy loads, at which it is almost uniform.

Synchronous Motors.

Synchronous motors are admirably adapted to factory service where absolute uniformity of speed is required, and where the extra installation of a direct-current supply for their field excitation is not deemed objectionable. While induction motors are always wasteful of some energy, through their high self-induction, synchronous motors may on the other hand be brought into that condition of operation practically equivalent to the use of direct-current motors, at least for a large range of their loads. In other words, the power factor of a synchronous motor may be made almost anything from zero to unity, according to the extent of excitation of its fields by the direct current applied for this purpose.

When made in the revolving field type, synchronous motors are self-starting from rest, at light loads. They may be very heavily overloaded, without falling out of synchronism or out of step, and when they do for an instant, they may be brought back again by throwing off some of the load. A well-designed synchronous motor will carry at least three times its full normal load, and not drop out of step. If an induction motor is built for such overloads it is likely to have quite low efficiency at ordinary loads.

Combined Induction and Synchronous Motor Working.

The ideal conditions in a factory installation no doubt would be secured where both induction and synchronous motors were used, the former for small machines and direct driving, the latter for operating a set or group of machines. The synchronous motors would be started up just before beginning the work of the day, have at all times a light constant load, and might easily be so regulated as to produce an almost balanced system in combination with the induction motors. In such a system of transmission the lagging currents of the induction motors would be offset by the leading currents of the synchronous motors, if the latter were operated to produce such leading currents. The whole system would be operated practically throughout quite a range of load variations, as if it were a simple direct-current system. The advantage of such a condition is apparent: it means least installation for any given output, or greatest output for any given capacity of generating plant. The group method of electric driving is much better adapted for small machines, up to and including two h. p. capacity, and especially where such machines are in almost constant service. Above this size, individual motor driving becomes more and more efficient, particularly if the machines are operated only a fraction of the day.

Economies Effected by Electric Transmission.

It might naturally be expected that the greatest saving would be noticed in those factories engaged in heavy machine work, where the loss in shafting and belting amounts to over 50 per cent of the total power developed at the engine. On the other hand, many small industries have introduced electric driving to marked advantage. A few cases may be cited. No doubt many similar cases may be added by members of the society from their own experience with electric driving.

Case I.—Electric driving reduced the cost one-half over the former method, for engineer, coal and water.

Case II.—Fuel account, by electric driving, reduced to one-fifth of what it formerly was by shafting and belting.

Case III.—Cost of power 44 per cent lower than what it was by shafts and belts.

Case IV.—Gross saving about 30 per cent with direct-coupled motors, and 22 per cent with geared or belted motors.

THE National Tube Co. will commence this week dismantling its charcoal iron works at McKeesport, Pa., as well as the puddling furnaces there, in order to make room for the enlargement of its finishing department. The charcoal iron department will be removed to Riverton where a structure twice the size of the former works is being erected.

AN INERTIA VALVE PERCUSSIVE TOOL.*—I.

BY CHESTER B. ALBREE.

In the last few years the use of compressed air as a motive power for machinery has wonderfully increased, especially for portable tools. This is mainly due to the advantageous qualities of compressed air over steam, the principals of which are:

First. Stability, or in other words non-condensation, permitting it to store indefinitely or to be transported long distances without loss of pressure other than that due to leakage of the conduit.

Second. Low temperature at which it can be used in hand-tools. Such tools could be run by steam but they would become so hot that a man could not hold them in the naked hand.

Third. The exhaust consists of fresh air, adding to the ventilation and comfort of the work room or mine, whereas the exhaust from steam motors has to be disposed of outside and is a nuisance, and with hydraulic systems the waste water, must be carried away in tubes or pipes.

Fourth. It can be used at any pressure and is easily produced, and its expansive qualities while not on a par with steam, owing to the absence of heat, yet can be utilized with good results, a feature entirely absent in the hydraulic systems.

Against these advantages are opposed some few disadvantages, such as the losses of power in the compression of air, due to the absorption of energy in the generation of heat, and the subsequent loss of pressure in the compressed air, as it cools down to the temperature of the surrounding atmosphere. The losses of steam and of the compressor are similar to those of any steam engine, and are all well known to all of you.

The absorption of heat from the surrounding media, caused by the sudden expansion of compressed air, often to such an extent as to freeze any moisture in the air or immediate neigborhood, will often prevent the use of high pressure air expeansively unless the air be reheated. This reheating of compressed air can be done at a very small fuel cost for the benefits obtained, and is used in many places. These points, however, are well understood, and compressed air is used intelligently.

With these few reminders of the qualities of compressed air, the subject of its application to percussion tools comes up, which can be better understood by prefacing with an outline of the development of percussion engines of different types; followed by a description of the inertia valve type which is the subject of this paper, and a discussion of some of the theoretical and engineering features involved in its design.

Percussion force as regards the actual work done upon the object struck, is applied in two ways: First. Directly, when the tool itself is propelled through space and strikes the object, when practically all the energy of the moving mass is expanded on the object struck. The commonest examples are the hand hammer, sledge, steam hammers, rock drills, mining stamps and others of similar character. Second. Indirectly, when the moving mass strikes an interposed tool, through which the energy is transferred to the object. In this case a portion of the energy is consumed in overcoming the inertia of the interposed tool, the remainder only performing useful work on the object. The energy thus consumed in overcoming the inertia of the interposed tool, supposing the energy of percussion force to be constant, varies by well-known laws, according to the weight or mass of the interposed body. The mathematical discussion of inertia is out of place in this paper, but those interested in the subject can find full discussion of it in Weisbach's, Rankine's and other works on applied mechanics. Examples of this second type of application of percussive force, are the mason striking his stationay chisel, the quarryman's drill struck by the sledge, and the chisel struck by the piston of a pneumatic hammer.

After hand hammers which have been useful from time immemorial, perhaps the lifting of a weight and subsequent dropping it was the first step in advance, and one which is still in daily use in drilling oil wells and driving piles. Trip hammers of a crude form were in use as early as 1600 and

* Read before the Engineers' Society of Western Pennsylvania, at Pittsburg, May 15 1900.

before them, spring catapults were used to throw great stones against castle walls. In a manner these may be classified as hammers of the first type, since the projectile certainly struck a blow, as do those of our great modern rifles with a little more force.

Nasmyth's steam hammer, invented in the early forties was a great step forward, and undoubtedly led to the invention of the rock drill, although as far back as 1683, a drill of the oil well type was used for rock, but only vertical holes could be drilled. In 1844, one Brunton, suggested compressed air in a cylinder as a convenient means of working a hammer to hit a drill and in 1859, Nasmyth, who was a wonderful engineer, at a meeting of the British Association, for the Advancement of Science suggested that the loss of energy in overcoming the inertia of an interposed tool could be overcome by lancing or projecting the tool itself against the work, and exhibited a sketch of an ingenious machine having a piston with a tool attached to the piston rod working in the cylinder, closed at the lower end and open at the top, so arranged that when the piston was mechanically pulled to the back of the cylinder, a vacuum would be created below it, and on releasing the piston the atmospheric pressure would drive it down with a constantly increasing velocity. This device he pointed out could be used to drill holes at any angle, as it was independent of gravity for its power.

Oct. 15, 1851, Cave, a Frenchman, patented a machine for rock drilling, run by compressed air, in which the valve was actuated by hand, and the drill rotated by hand. It was a double-acting engine, and was successfully used and was the pioneer rock drill in Europe. Couch, an American, patented a rock drill in 1849, in which both the valve motion and the rotation of the drill were automatically performed by the piston which in turn moves the valve. Such machines, if well made are not liable to get out of order, but the stroke is subjected to limitation within narrow range of length, and air is admitted before the end of the outstroke, as was described of the tappet valve type. In neither type has there been much attempt to use the air expansively, as the decreased velocity due to decreasing pressure and the additional mechanical complications did not seem to warrant it. The Optimus drill, of English make, is an exception. It belongs to the fluid-moved valve type, using the motive-fluid compound. The initial fluid driving the piston outward is used expansively to effect the return stroke. It is much in use abroad but has not met with much favor here.

Third. The so called valveless type, in which the moving piston acts as its own valve, as in its stroke it alternately opens and closes certain ports so that the fluid acts on each end of the piston in turn. The progenitor of this type was invented by John Darlington May 13, 1873, in England, and a great many were used, although now superseded by the modern drills of the first and second type described. (Fig. 1, Darlington valveless rock drill.) In this machine the motive fluid acts constantly on the smaller area of the piston. When the piston is at the outer end of its stroke, the space in the rear is open to the atmosphere and the constant pressure on the front area forces the piston back. In its motion, it closes the exhaust port and a back cushion is started in the rear. At a certain distance before the motion of the piston is entirely checked by the cushion, a by-pass leading from the front to the rear end of cylinder is opened, this by-pass being a little longer than the main body of the piston. Fluid rushes through this passage to the space in the rear of the piston, pressing on the large diameter of same

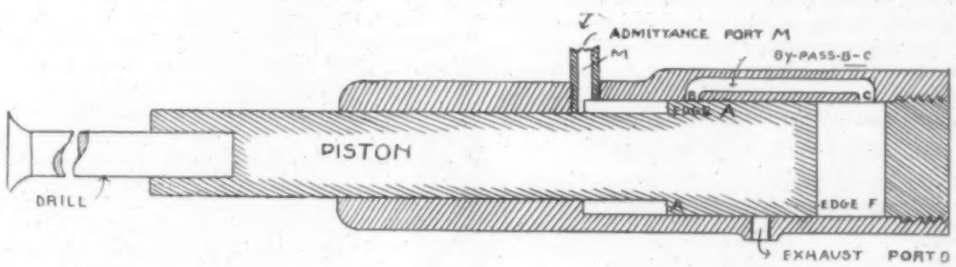


FIG. 1.—DARLINGTON ROCK DRILL. VALVELESS TYPE.

piston in its motion, and while it was a cumbersome machine requiring cranes to handle it, it was in its essential features the rock drill of today. Since that time there have been wonderful improvements in detail and numberless devices made for regulating and controlling the different parts, yet to America belongs the credit of the real development of the rock drill.

Methods of Admitting Power for Percussive Tools.

There are three methods of automatically controlling the admission of motive fluid in rock drills and other percussive engines:

First. The tappet valve type, in which projections attached to the reciprocating part strike triggers or other devices which in turn move the valve. There are several objections to this type. The clearances are necessarily large, the liability to breakage is great, due to the intricacy and multiplicity of parts, the small variation of stroke permissible, and the fact that the valve must be moved before the piston has completed its stroke. This is a good feature on the back stroke, as it permits of forming a sure cushion preventing piston hitting back cylinder head, but on the front storke it is bad, as it allows initial pressure air to bear against and partially check the velocity of the piston, hence weakening the possible blow. Owing to the skill and care with which machines of this type are constructed, most excellent results have been and are now being accomplished with them, and such well-known manufacturers as the Ingersoll-Sargeant and the Rand rock drill companies continue to sell them in large quantities.

Second. The fluid moved valve type, wherein the piston itself at certainn parts of its travel admits a supply of motive fluid to move the valve or to move a supplementary with initial pressure, and drives the piston forward against the pressure of the small diameter with a force due to the excess of area, under the same pressure per square inch. Very early in the down stroke the by-pass is closed again by the body of the piston, and further force is derived only from the expansion of the body of high pressure fluid locked in the rear of the piston. Against this decreasing pressure of expansion is opposed the constant pressure on the small front area, so that the net forward force is constantly decreasing, although sufficiently combined with the momentum already acquired, to propel the piston its entire stroke with considerable velocity utilized in effective work on the object struck by the tool. When nearly at the end of the outstroke, the exhaust in the rear is again opened so that further travel is entirely due to the acquired momentum. As soon as the blow is struck, the piston is stopped and immediately is pushed back by pressure on the front area and the operation repeats. The conception is unique and beautiful, the drawback being the loss of velocity on the outstroke, as described. The action of this tool has been explained in detail as it was in the endeavor to overcome this defect that experiments and study were made as a problem.

In Darlington's drill the initial pressure was used for the back stroke and the expansive force used for the outstroke. On April 13, 1880, William L. Neill took out a United States patent for a valveless rock drill reversing this action so that the effective outstroke was due to initial pressure, and the return stroke to expansion. This device never was used practically as far as can be ascertained, probably due to the fact that a cushion was formed in front of the piston when the exhaust was closed, increasing the force as the piston progressed and decreasing the velocity thereof.

Evolution of the Pneumatic Hammer.

Having thus examined the three principal types of valve motion in ordinary use, we come to the development of the pneumatic hammer, which consists essentially of a small portable cylinder in which a piston reciprocates very rapidly, striking a great number of blows per minute on the end of a tool inserted in the end of the cylinder. They belong to the second class of percussive tools, having a tool interposed between the hammer and the work.

McCoy may be said to be fairly entitled to the credit of the first application of such tools to heavy work, such as chipping metal, caulking boilers, cutting stone, etc., which had been done previously by hand and hammer. He exhibited his device before the Franklin Institute, which awarded him a medal for a new and meritorious invention of real utility. He was not, however, the originator of the idea, as long before he perfected the tool for heavy work it had been used as a dental plugger, a device working compressed air in a cylinder, so that a piston struck the end of a tamping tool used to insert gold into the cavities in teeth. There were several patents taken out for such tools and successful results attained in the '70's.

The pneumatic hammers followed in a general way the valve motion used in rock drills, with modifications adapted to smaller and more portable tools. The valveless, as also tappet and fluid-moved valve types are used. Of the former the Q. & C. tools are quite well known. For work within their range they are admirable, owing to their simplicity of design, small size and great rapidity of short stroked blows. For light chipping, caulking and other similar work they can hardly be excelled. A somewhat similar tool, the Kotten, is made for use in carving stone and marble, die sinking and other delicate work, and has a very short stroke, about ¼ to ⅜ inch, running as high as 10,000 or more strokes per minute. For heavy chipping riveting and other work the blow of a valveless tool is not heavy enough to do the work well and tools with a controlling valve are used, allowing of much longer stroke and higher velocities of piston travel.

Fluid-moved Valve Type Hammer.

Of the fluid moved valve type, the Boyer hammer made by the Chicago Pneumatic Tool Co. and the Little Giant hammers, made by the Standard Pneumatic Tool Co. are the best known. In these a small valve, located in a chamber in the rear of the piston traveling parallel or at right angles to the axis of the piston is actuated by air pressing on differential areas, moving it alternately to and fro, opening and closing ports controlling the admission and exhaust to the cylinder. Suitably placed small ports are closed and opened by the piston in its travel that permit air to act on and move this valve. Excellent work is accomplished by these tools, and a skilled workman can do from four to six times as much as can be done by hand tools alone. They are in use in nearly all the progressive machine, boiler, bridge and shipworks in this country and in a great many abroad. In driving rivets greater force is required than in chipping. This can be attained in a pneumatic hammer in two ways: by larger mass in the piston and by greater velocity.

The force of a blow varies directly as the mass or weight and as the square of the velocity; hence a tool can be designed with a heavy piston and short stroke with high pressure, or the same results attained by larger cylinder diameter with low pressure, but the better and generally adopted method is to increase the length of stroke, keeping the diameter small. This would follow theoretically as a result of the law given. There is again a practical reason why the diameter should be kept small. Because the reaction would otherwise be too great. Since action and reaction are equal and opposite in direction, the total force used to propel the piston out presses equally against the back cylinder head and a man can withstand but a limited amount of such pressure when holding the tool, thus limiting the diameter to such size as has been found practicable.

To meet the demand for a long stroke tool the Chicago Pneumatic Tool Co. has put on the market the "long stroke Boyer hammer," having a piston about 1½ inches diameter, with 9 inch stroke, striking a very hard blow due to the continued application of a constant force through the long stroke, constantly accelerating the piston velocity. The valve is moved by tappets and at pressure of about 100 pounds per square inch. Seven-eigth inch rivets can be set down much quicker and about as tight as by hand but the rivets do not fill the hole as well as those driven by compression riveters, driven by air, steam or hydraulic pressure, nor nearly so quickly. For the erection of structural work or for any field riveting it fills a long felt want, doing the work sufficiently well.

The Inertia Valve Hammer.

With this perhaps rather long examination of what has been accomplished in percussive tools, and study of the underlying principles, the subject of this paper, "An Inertia Valve Percussive Tool," will be discussed. Recalling the Darlington valveless rock drill and referring to the drawing (Fig. 1), we notice that when the rear edge F of the piston passes the exhaust port D on the back stroke, a cushion is at once started in the rear, increasing in pressure as the piston travels back. When the front A J of the piston passes and opens the entrance B of the by-pass B-C, initial pressure air flows through the admittance port M, the cylinder cavity and the by-pass to the rear of the piston, immediately checking any further movement and forcing the piston out, by reason of the greater area of surface F over surface A. In such forward movement, the edge A again closes the port B of the by-pass, cutting off the supply of further initial pressure air to the rear so that any additional pressure or force upon a rear area of the piston must be derived from the expansive action of the air locked in behind it, which is opposed by the initial pressure air bearing on surface A which is constant at all points of the stroke, either forward or back.

(Concluded next week.)

THE T. A. Gillespie Co., of New York and Pittsburg, has secured the contract for laying and furnishing 18 miles of water pipe for Jersey City's new water plant. The contract amounts to $1,500,000. The Carnegie Steel Co. will furnish the steel plates of which about 15,000 tons will be required. Each plate is 19x19 feet and is bent and riveted at the Gillespie plant at Palestine, N. J. The work will be finished in about a year.

FOUR well known English iron masters were in Pittsburg last week and during their two day's stay visited the plants of the Carnegie Steel Co., and the works of the Westinghouse Electric & Mfg. Co., at East Pittsburg. The party after reaching New York went first to Philadelphia where the Pencoyd Iron Works were visited and then came on to Pittsburg. From Pittsburg they went to Chicago to visit the works of the Federal Steel Co. The visitors are S. M. Wesgarth, Middlesboro, Eng.; Capt. R. Hedley, Spennymoor; Charles T. Bagley, Stockton-on-Tees, and Henry Crowe, West Hartlepool.

ACHITECT BRADY has in preparation plans for machine hops and power plant, to be erected for the department of public safety at Pittsburg.

THE Valley and Haselton mills of the Republic Iron & Steel Co., at Youngstown, O., were closed last week. It is estimated that the Youngstown mills together made about one-third the full product in the week.

THE Alabama Steel & Wire Co., Birmingham, Ala., is well supplied with orders and is running full.

Neal Bros., Pittsburg, who recently leased newly discovered ore lands in Berkeley county, W. Va., are said to be negotiating for the idle B. & O. shops at Martinsburg, W. Va. The confirmation of this report could not be secured in Pittsburg.

THE American Tin Plate Co. will shortly increase its Laughlin plant, at Martin's Ferry, by adding 12 hot mills. Two acres of land have been purchased adjoining the present plant, upon which the additions will be built.

THE Youngstown Specialty Co., manufacturer of cans, is installing new machinery which will increase its capacity 100 per cent, or to 72,000 cans a day.

COMMUTATOR TRUING DEVICE.

The Akron Electrical Mfg. Co., of Akron, O., manufactures the Car commutator truing device, which will turn up the commutator of a generator without removing the armature from its bearings. The tool is built on the engine lathe principle and is directly attachable to any machine having a removable bearing cap. It is claimed that it will do work that will compare favorably with that done in a lathe, with the additional advantage that the armature need not be removed from the machine. The work is done while the shaft is running in its bearings. The construction of the device will be made plain by reference to Fig. 2.

The T-shaped clamp 1 is bolted to the machine in place of the bearing cap; set screws 8 being provided in its lower end to rest against the pedestal and steady the tool. On this piece is clamped the tool bar 6, by means of a saddle that allows the bar movement both perpendicular and parallel to the face of the commutator and instantly clamps the two pieces by drawing the lever nut 4. The bar 6 carries the slide 10, which in turn carries the tool post 2. This slide is driven relative to the bar by means of a screw and hand wheel, so giving the feed. The tool bar is also adjusted to any width of commutator up to 12 inches in the type A machine and to 18 inches in the type B. This adjustment is accomplished by slacking the lever nut and sliding the bar in or out the necessary distance parallel to the commutator. The bar may also be reversed by slacking the lever nut and removing the top half of the saddle. This, with the double tool post socket, makes it possible to use the device on either side of the machine, depending on the more convenient direction of commutator rotation. The adjustment of the tool at right angles to the face of the commutator is also accomplished by a hand wheel and screw operation on the saddle 7, it being first necessary to slacken the lever nut slightly. In operating the device this nut should always be drawn tight, but when it is desired to face the end or leads of a commutator, the nut may be slackened enough to allow the requisite movement. At the extreme outer end of the tool bar a threaded rod 3 is screwed in, and intended to be screwed down to a solid support, acting as a jack to steady the tool at the extreme limit of its cut. A center 5 is attached to the device by means of adjustable brackets, to prevent end motion in the commutator while being turned.

The method of attaching the device to a generator is shown in Fig. 1. The tool bar and tool post are so set as to give the tool the proper position against the commutator. This is done if necessary by reversing the tool bar in its saddle and putting the tool post in its appropriate socket. The tool is then ready to be placed in position, this being accomplished by removing the bearing cap and bolting the device in its place. The bolt or bolts, passing through the slot in the piece 1; the tool bar is adjusted parallel to the face of the commutator by means of a pair of calipers, and then the set screws 8 are drawn down against the pedestal, a shim being inserted to prevent marring. The screws are tightened just enough to steady the device, care being taking not to spring the piece 1. The rod 3 is screwed down to a solid support, a piece of timber answering well. The tool is adjusted to the desired cut by means of the cross feed, which should be slow, as a smoother job is thus obtained. For the best work a commutator speed of from 200 to 250 feet a minute is used and in the case of large machines this can be obtained by slowing the source of power, and also often with small sizes. A crank for attachment to the pulley is provided so the machine can be operated by hand if necessary.

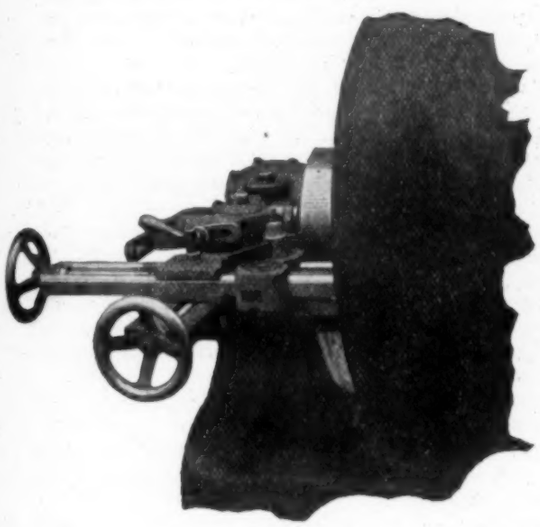


FIG. 1.

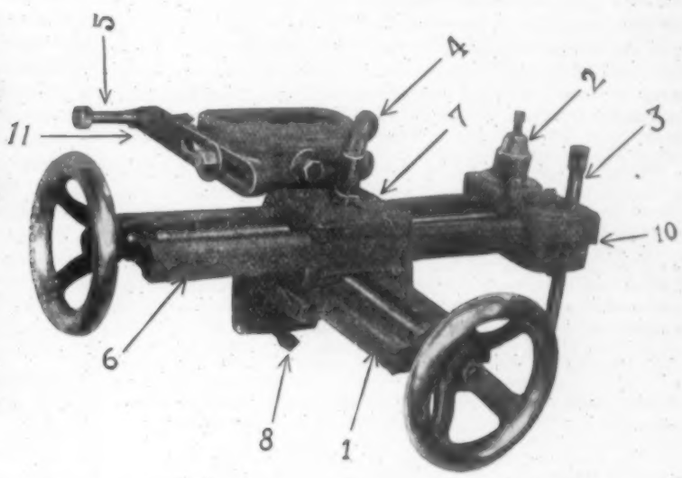


FIG. 2.

COMMUTATOR TRUING DEVICE.

EMPLOYERS AND MACHINISTS AGREE.

The arbitration committee of the National Metal Trades Association and the International Association of Machinists adjourned at New York, Friday, May 18, having reached an agreement after a session of seven days. The result of the arbitration, which for so considerable a time was in doubt, while it may not be in every particular satisfactory to all represented by it, is highly creditable to the tact and conciliation and honest purpose of the participants. To a considerable extent the demands of the men as to hours and apprenticeship are granted, but the employers remain in control of their shops and are judges of the fitness of their employes and of their ability to earn the maximum wage. President D. McLaren, of the National Metal Trades Association, was chosen to preside, and Douglass Wilson, of the machinists' union, was made secretary. The action of the conference as given out officially was embodied in a series of preambles and resolutions as follows, which it was voted should take effect at once:

"Whereas, Conflict between capital and labor has been disastrous alike to each, the International Association of Machinisst and the National Metal Trades Association, appreciating the importance of adopting some measures that would provide against strikes and lockouts in the future, met in joint conference for the purpose of adopting such measures as would be alike just to the employe and the employer. This conference meeting in New York, May 10, was in continuous sessoin until May 18, having formulated a code by a series of resolutions, which for the first time established the value of national arbitration.

"Resolved, That the strikes be declared off in the factories of the members of the National Metal Trades Association in the cities of Cleveland and Paterson, the National Metal Trades Association members of this board to wire their members in these two cities to meet a committee from each shop of their former employes to arrange for the return of as many men as their present necessities require and that subsequent requirements of men shall be filled from their former employes whom they may not be able to reinstate at the present time."

The intent of this last clause is that if, within the next six months, former employes make application for reinstatement

they shall be reinstated provided there are vacancies for them.

"Where strikes exist in these cities in firms other than the members of the National Metal Trades Association who will agree to the settlement herein agreed to after the same has been adjusted by this body, such strikes shall be declared off also.

"Whereas, Doubts have been expressed by members of this board representing both parties to this conference, as to the ability of their respective organizations to control their members; now, therefore, be it

"Resolved, That the members of this board pledge themselves each to the other that in case of the refusal of any member of the respective organizations represented, to observe and carry out in an honorable manner the findings and decisions of this board, in regard to strikes and lockouts, based upon a fair, just, and liberal interpretation of what is known as the Chicago agreement, we will report such member or members to our respective organizations for discipline, suspension, or expulsion, as the merits of the case may justify."

The resolutions specify what constitutes a machinist and lay down rules as to overtime and apprentices as follows:

"Machinists — A machinist is classified as a competent general workman, competent floor hand, competent lathe hand, competent vise hand, competent planer hand, competent sharper hand, competent milling machine hand, competent boring mill hand, competent maker and competent linotype hand. To be considered a competent hand in either class he shall be able to take any piece of work pertaining to his class, with the drawings or blue prints, and prosecute the work to successful completion within a reasonable time. He shall also have served a regular apprenticeship or have worked at the trade four years. It is understood that the question of competency shall be determined by the employers. Since the employers are responsible for the work turned out by their workmen, they shall have full discretion to designate the men they consider competent to perform the work and to determine the conditions under which it shall be prosecuted.

"This last paragraph does not in any way destroy the right of appeal from any apparent or alleged unjust decision rendered by an employer of labor or his representative, in conformity with the powers invested in him in this paragraph.

"Overtime—All overtime up to 10 o'clock p. m. shall be paid for at a rate of not less than time and one-quarter time, and all overtime from 10 p. m. until 12 midnight shall be paid for at a rate of time and one-half time, and that after 12 o'clock and on legal holidays and Sundays shall be paid for at a rate of not less than double time. In case of emergencies, where shop machinery breaks down, or runs down, and it is absolutely necessary to repair the same so that the factory can run on Monday, this shall be paid for at a rate of time and one-half time. The repairs here referred to apply only to machinery of the employers.

"The foregoing rates are not to interfere in any way with existing conditions; that is, where a higher rate than the above is paid now, no reduction will take place. Such rates for overtime shall not apply to men regularly employed on night gangs.

"Apprentices—There may be one apprentice for the shop and in addition not more than one apprentice to every five machinists. It is understood that in shops where the ratio is more than the above no change shall take place until the ratio has reduced itself to the proper number by lapse or by the expiration of existing contracts.

"Fifty-seven hours shall constitute a week's work from and after six months from the date of this agreement, and fifty-four hours shall constitute a week's work from and after 12 months from the date of this joint agreement. The hours to be divided as will best suit the convenience of the employer.

"Note—This not to interfere in any way with the shops where a less number of hours per week is already in operation.

Special action was taken on the Paterson, N. J., situation as follows:

"Whereas, it is the sense of this board, based upon the evidence before it, that the strike at Paterson was due to a misunderstanding as to the intent of the manufacturers regarding an advance in wages; and,

"Whereas, the members of the National Metal Trades Association in Paterson show that since the uniform advance in wages of 10 per cent was requested they have advanced their machinists to an average amount equal to about 7 per cent; now, be it

"Resolved, That the decision of this board is that a 10 per cent increase in wages be granted in Paterson over and above the rate prevailing Dec. 19, 1899, at the time the request was made for the 10 per cent increase in wages. This to apply only to the shops in which the strikes occurred that were members of the National Metal Trades Association.

INDUSTRIAL SUMMARY.

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

New Buyers in the Market, and Some of Their Wants:—

The Standard Tack & Brad Co., of Indianapolis, has been incorporated by Jesse Atherton and others with a capital stock of $20,000.

The Crescent Mfg. Co., Iowa City, Ia., has been incorporated with the following officers: President, D. F. Sawyer; vice-president, Ed. B. Wilson; secretary and treasurer, J. G. Lindsay. This new company is an enlargement and successor of the Crescent Fence Co.

The Williams Steel Co., of Parkersburg W. Va., has been incorporated with a capital of $750,000 for the purpose of manufacturing and dealing in iron and steel. The incorporators are R. B. Scandredd, T. C. Noble, both of Allegheny; H. J. Williams and S. G. Smith, both of Carnegie.

The Seamless Steel Tube Co. has been organized at Detroit, Mich., with a paid-up capital of $100,000, to manufacture steel boiler tubes, etc., by the cold process. James McMillan is president of the company and William Thornburg, general manager.

The Monarch Gas Engine Co., Indianapolis, Ill., has been incorporated with the following officers: President, P. K. Buskirk; secretary, Fred Matthews, and manager, J. E. Matson. The product will be gas engines, 1 to 100 h. p., dynamos, electric machinery and belted pumps for gas engines. A building, 60x250 feet, will be erected, and the company is remodeling the old plant located at New York st. and Baltimore railroad.

The Canton Crucible Steel Co., Canton, O., has been incorporated by Edward F. Weckel and others, capital, $15,000. The new company will make tube drawing tools, taps, edge tools, plow shares, lathe tools, dies, shear blades, steel castings and all kinds of steel made by crucible and open-hearth processes.

A. Hood and Geo. Hayes, of Birmingham, Ala., have purchased a controlling interest in the Sheffield Foundry & Machine Co., and will incorporate as the Sheffield Iron Works, capital, $10,000. General improvements will be made to the plant.

The Bing Foundry & Machine Co. has been incorporated at Philadelphia, Pa., capital $25,000.

Fires and Accidents:—

Fire in the Carondelet Foundry Co.'s plant at St. Louis Mo., caused much damage to several of the buildings. Loss covered by insurance.

A small fire in the Fergus Iron Co.'s foundry at Fergus Falls, Minn., caused $1,600 loss.

Fire partially destroyed the Mesta Machine Co.'s plant at Homestead, May 19. Loss, $50,000.

The Sharpsville Foundry, at Sharspville, Pa., was destroyed by fire. The loss is estimated at about $12,000. Partly insured.

New Construction:—

The Tidewater Steel Co. is making extensive improvements to its plant at Chester, Pa. A new engine, new rolls, new furnaces, new shears, new cooling machinery, new chipping machinery and gas connections have been made at the large plate mill. The small mill has been rebuilt and new gas producers and boilers have been put in. In the open-hearth department three 25-ton furnaces have been torn down and replaced by five new 50-ton furnaces now building.

The Central Foundry Co., Vincennes, Ind., intends to build a foundry 210x140 feet in the near future.

The Niagara Radiator Co., is making $30,000 worth of improvements on its plant at Rochester, N. Y.

The Roane Iron Co., has begun active work on a new furnace to be erected at Rockwood, Tenn. This company has paid off a floating debt of $75,000 and a dividend of 20 per cent to stockholders since the iron boom began, and has accumulated a large surplus with which to erect a new furnace.

Important additions are being made to the machine shops of the Lake Shore railroad at Air Line Junction, O. New machinery, including drills, planers and presses has been

added so that now cars and locomotives can be rebuilt at the shops.

The Yanman & Erbe Mfg. Co, manufacturers of metal specialties, at Rochester, N. Y., will build a brick factory to cost $50,000.

The foundry of Hershey P. Kock at Manheim, Pa, which was burned recently has been rebuilt and is now in operation.

The Standard Automatic Gas Engine Co., of Youngstown, O., will build a new machine shop, 80x204 feet.

The Kilbourn & Jacobs Co., Columbus, O., will build a $15,000 brick factory, 97x417 feet.

The South Bend Malleable Iron Co., of South Bend, Ind., will have its new building completed by the close of summer.

The Haven Malleable Casting Co., of Cincinnati, is building a new factory to employ about 300 men.

The Chandler & Taylor Co., Indianapolis, Ind., has obtained 22 acres of land on West Washington st., to which it will remove. Work on the new buildings will be commenced at once and they will probably by completed by next fall. Among the special features will be lunch, bath and reading rooms for the employes.

The Union Iron Works, at Erie, Pa., will build an additional boiler house.

The Pittsburg District:—

The Pittsburg Gauge & Supply Co., Pittsburg, is doing a large business with the Pittsburg steam specialties. "Does it Pay?" is the title of its latest work on feed-water regulation which treats also on boiler management. The Pittsburg feed-water regulator, it is claimed, has demonstrated that the feed water can be successfully controlled automatically. Among recent installations are those of the Allegheny City lighting plant, 10; Apollo Iron & Steel Co., 30; Kaufman Bros., 4; Montrose pumping station, 6; American Tin Plate Co.; Shenago Furnace Co.; 20th ward school, Pittsburg; Moorehead Bros.' mill, and Aultman & Taylor Machinery Co., etc. The Pittsburg safety water columns, recording pressure and vacuum gauges, rotating gauge cocks, steam gauges, etc., are reported to be in demand.

Jones & Laughlins' No. 13 mill at their South Side plant, Pittsburg, resumed operations this week after being shut down for about ten days. Owing to an accident it was found necessary to suspend operations until the heating furnaces could be repaired.

Edward E. Erikson, engineering contractor, Pittsburg, has been awarded the contract for the erection of two open-hearth furnaces for the steel-casting plant to be erected by J. S. Coxey at Mount Vernon, O. One of the furnaces will have a capacity of 125 tons and the other of 115 tons. The American Rolling Mill Co., whose plant will be located at Middletown, O., has also awarded a contract to Mr. Erikson for a large amount of its installations. The contract calls for one 125-ton open-hearth furnace, one billet heating furnace, two annealing furnaces together with gas producers and connections.

The Pittsburg Steel Shafting Co, granted its employes a voluntary advance of 10 per cent last week.

Two men were seriously injured by an explosion at furnace 1 of the Edgar Thomson works of the Carnegie Steel Co., at Braddock, Pa., Monday morning. The furnace was slightly damaged.

The suit of the Wheeling Corrugating Co., Wheeling, W. Va., against the Old Meadow Rolling Mill Co., of Scottdale, Pa., for $25,000 damages for alleged breach of contract, in failing to furnish a stipulated quantity of Bessemer sheets was settled in the United States Circuit Court, sitting in Allegheny county, Pa. last week.

S. L. Perelman, representing the Putiloff Iron & Steel Works, St. Petersburg, Russia, was in Pittsburg last week. Like the many other foreigners who come to America's great steel center, he visited the works of the Carnegie Steel Co., and the plant of the Westinghouse Electric & Mfg. Co., East Pittsburg.

The puddling department of Moorehead Bros. mill, Pittsburg, will resume operations within a few days. It was shut down several weeks ago for the purpose of making repairs.

The Pittsburg Bridge Co. has just finished the steel frame work for the new buildings of the Braddock Machine & Mfg. Co., Inc., engineers founders and machinists, Braddock, Pa., and the cranes are now being put up. The new foundry is about ready.

Officials of the Pressed Steel Car Co., Pittsburg, deny the reports emanating from Chicago to the effect that a consolidation with the American Car & Foundry Co. is shortly to be effected.

Edward E. Erikson, contracting engineer, Garrison Building, Pittsburg, has received a contract from the C. Pardee Works, of Perth Amboy, N. J., for a heating furnace, 27x70 feet, two gas producers and all necessary connections.

Chicago District and Northwest:—

The Union Malleable Iron Works, of Moline, Ill., is doing a small amount of test work in its new plant, which will be in full operation by July 1. It will employ 500 men.

The Illinois Steel Co. has contracted with the Nordberg Co., of Milwaukee, Wis., for two pumping engines for the South Chicago works, each with a capacity of 40,000,000 gallons a day. The company is also at work on a 6,000,000-gallon pumping engine for the city of Pittsburg.

The shops of the Beaver Dam, (Wis) Malleable Iron Co., which were burned recently, will be rebuilt at once.

The decision of the Aermotor Co. to remove from its present location gives Chicago Heights one of the largest industrial enterprises in the Chicago district. The company started at its present site 12 years ago to manufacture steel windmills, towers, tanks and all machines that can be driven by windmills. The business of the company has far outgrown the present facilities, hence the removal. The new tract includes 20 acres and is reached or traversed by the Chicago Terminal, Elgin, Joliet and Eastern Belt Line, Michigan Central, Chicago & Eastern Illinois, Lake Shore & Eastern and Chicago Heights Terminal railroad lines, which furnish switching facilities that permit of entirely dispensing with teaming. The entire tract—two and one-half times the size of the present location—will be covered with buildings and tracks necessary for its business. Ground will be broken at once and the plant will be occupied and running by Aug. 1. The company gives employment to 1,000 men, most of them skilled artisans.

The Gardner Governor Co. has finally decided to remain at Quincy, Ill., in spite of very favorable offers from other cities. It has also decided to erect a new plant and increase its employes from 175 to 400. The machine shop of the new plant will be 140x300 feet and work will be begun in a short time. The product of the company is the Gardner governor for steam engines.

The converter and billet mills of the Illinois Steel Co. resumed work May 15, after a week's idleness. Eight hundred men went back to work.

The Nordberg Mfg. Co., of Milwuakee, is constructing a mammoth steel pump and 75 h. p. Corliss engine for the Isle Royal mill near Houghton, Mich. The pump will have a capacity of 16 000,000 gallons per day.

An addition to cost $15,000 is to be built by the Illinois Malleable Iron Co., for its plant at No. 527 Diversey ave., Chicago. It is to cover 151x80 feet of ground.

The Chicago Pneumatic Tool Co. and Joseph Boyer, of St. Louis, have entered suit at Philadelphia against the Philadelphia Pneumatic Tool Co. and the Kellar Tool Co., for alleged infringement of the Boyer pneumatic tool patents.

The mill at Hammond, Ind., has been closed for an indefinite period, owing to dullness of Chicago trade.

Chas. B. Hammet and F. C. Coslet, of Tuscola, Ill., will erect a machine shop and will do general machinist's work of all kinds.

The Maywood Foundry & Machine Co., Monadnock, Chicago, will erect at Maywood, Ill., a two-story steel foundry, 150x65 and 40x30 feet in size. The exterior will be of glazed tile. The company will also build a two-story steel machine shop, 100x150 feet in size, and an engine and boiler house.

Charles H. Besly & Co., 10 and 12 N. Canal st., Chicago, call attention to their mannocitin, a rust preventive for machinery, engines, tools, guns, cycles, and all metals. It is composed of greases and volatile oils. It remains neutral, and contains no acid. On application the oils evaporate, leaving an air-tight film or skin, which adheres tightly to the metal, and permanently prevents rust and corrosion. Mannocitin is presented to the trade for its ability to withstand salt air,

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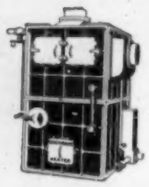

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When a man is feeding cold water, and he has somewhere about his establishment exhaust steam going to waste, or exhaust steam going into a condenser, that could be utilized for heating his feed-water, he has the opportunity, through us, of discovering, gaining control of and owning a veritable gold mine—a something that will pay dividends from the very first day it is started up; and, generally, the total first cost, including all the expenses of installation, will be more than offset by the first year's savings.

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We will gladly tell you how it is done, and how much it will cost you, if you will submit the necessary particulars.

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salt water, rain, snow, dampness, perspiration, steam, gases, and fumes of acids and ammonia. The manufacturers have a special booklet describing this product, and will send a new catalogue devoted to their entire line of supplies.

General Industrial Notes:—

The strike at the boiler works of the Stirling Co., at Barberton, O., was settled last week by granting the men half the advance asked for. Their demand was for an increase of 10 per cent.

The Empire Iron & Steel Co. will shut down its Bellefonte, Pa., furnace for six weeks to line its stack.

The Charlotte Mfg. Co., which will remove to Ypisilanti, Mich., will be known as the Ypsilanti Mfg. Co. and will be composed of J. S. Moon and I. N. Swift. The specialties of the comany will be sad irons, gas plates, and oil cooking stoves.

The United States Cast Iron Pipe & Foundry Co.'s Chattanooga, Tenn., plant has suspended work until July or August to reduce stock on hand.

The Vulcanus Forging Co., Cleveland, O., has recently shipped a carload of car forgings to the New Orleans & Northwestern railroad, at Natchez, Miss.; a Hathaway patented transfer table to the Consolidated Street Railroad Co., Grand Rapids, Mich.; a carload of air brake pins to the American Car & Foundry Co., Huntington, W. Va. It reports a large number of orders on hand for future shipment.

The Seamless Tube Co., of Detroit, Mich., which was organized last week, will occupy the old buildings of the Michigan Malleable Iron Co. The plant will employ several hundred men. The president is Senator James McMillan and the other chief stockholders, W. C. McMillan, T. H. Simpson and Wm. Thornburg.

The Lukens Iron & Steel Co., Coatesville, Pa., has purchased a combined slabbing and blooming mill, which was designed by Julian Kennedy, of Pittsburg, for the Nicopol-Mariopol Mining & Metallurgical Co., of Russia, but for trade reasons was not taken by that firm. The mill will roll slabs up to 4½ feet wide, and has grooves also for 4, 6 and 8-inch blooms, as well as 14-inch slabs, these being rolled without the aid of the vertical rolls, in the ordinary way. Large slabs will be rolled with horizontal and vertical rolls like a universal mill. The mill pinions are of cast steel, with cut gears, 8-inch pitch. The rolls, roll housings, and pinion housings are all steel, as are the table rollers and frames. The bevel pinions driving the table rollers are steel cut gears. The spindles between the rolls and pinions are 20 feet long, made of hollow forged shafting by the Bethlehem Steel Co., and the couplings are of a special design by Mr. Kennedy.

The various plants at Chester, Pa., are enjoying a good business. The South Chester Tube Works, the National Tube Works plant and the American Steel Casting Works are working full turn with a good demand for their product. The new Seaboard Steel Casting Co.'s work will be in operation in the fall. The Chester and Solid Steel casting companies are enlarging their plants to employ more men.

THE next annual convention of the Tin Workers' International Protective Association of America will be held in Cleveland in 1901. This was decided at the convention which came to a close in Pittsburg last week. No wage scale was formally agreed upon, as it was deemed best to confer with the Amalgamated Association, which is in convention at Indianapolis. While the wage committee reported to the convention a new scale averaging an increase of from 20 to 25 per cent, it will not be enforced until after a conference with the Amalgamated Association.

H. V. Finkelstein, of Peoria, Ill., dealer in machinery and supplies, carrying on also a general wreckage business, reports that as against a business of $750,000 last year, that of 1900

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Safety Water Column.
Steam Separator.
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These goods are unchanged in either the internal mechanism or external appearance, and all patent litigation is ended by the change of names.

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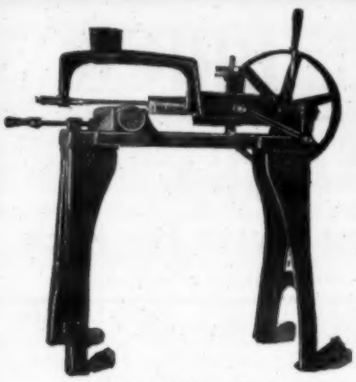

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THE Q AND C

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bids fair to be close to $1,000,000. Ten acres of ground are required for the business on its present scale. Some time ago he purchased the Wesley City coal mines which are being successfully operated. Six traveling representatives are in constant service. Among the deals of considerable size undertaken by this house were the purchase of the intra-mural electric railroad at the World's Fair, a number of street car lines and the demolition of a dozen distilleries.

THE COST OF MACHINE WORK.

The question as to the "cost" of a machine, or of the product turned out by it, involves a number of items, at least one of which is frequently too little considered. Of course, it is well known that when a new machine is once put into service it immediately become "second-hand," thus entailing an immediate loss in market value. The longer the machine is in use, and the less carefully it is treated, the more rapidly it depreciates, and the extent of the depreciation, whether it be much or little, must be considered in estimating from time to time the present value of the machine. Similarly, the cost of maintaining the machine in a sufficiently good condition to insure its efficiency is an item which cannot be overlooked.

There is, however, another item, which, in many cases, is of even greater importance. A manufacturer obtaining a new machine, especially if it is designed for some work for which there is a limited market, stands, in these days of rapid improvement and development, face to face with the question, "How long before the machine must be supplanted by a better one in order that I may compete in cost of product with others who may at some time obtain a more efficient machine for doing the same work?" In other words, what is the percentage of the hazard of being compelled to abandon the machine and procure another of later improvement in order that he may maintain his market, or may continue to make a profit on his manufactures?

Even the most casual glance at the history of special machinery, as employed in American manufactures, for example, during the past two or three decades will show that this "risk," as insurance people would term it, is by no means a small one. It is a question if the majority of standard machines can be used profitably for a period of twenty years, even if maintained in a perfectly efficient condition. Indeed, it is a question if any machines, in such a sense, are strictly standard. Clearly the majority of the machines in use are to a certain extent special, and the more rapid the improvement in any particular art, the more rapidly the machines become relatively inefficient, as measured by their earning capacity.

A somewhat extended observation in this line leads the writer to believe that ten years is, at the present time, a high average for the life of automatic machinery generally, when considered from this point of view. Suppose, for instance, a manufacturer has the opportunity of obtaining a special machine ten years old for an extremely low price, or of paying a relatively high price for the latest improved machine for the same purpose, which one is the best for him to buy? Usually the latest and best will be found the cheapest. A small advance in output quality, and economy of labor more than offsets a very large difference in first cost.—[Francis H. Richards in Cassier's Magazine for June.

Mr. Bowron's View After a Trip Abroad.

Mr. James Bowron, treasurer of the Tennessee Coal & Iron Co., who has just returned from an extensive trip abroad, says: "The foreign iron and steel situation exhibits remarkable activity and strength and they say over there that that condition will continue unless we undertake to cause a break from this side. They maintain that America sets the pace and whatever we do they will have to follow. The German and also the English markets are doing a good business, and

40 Brands of PIG IRON.

20 Years of Experience

in the Pig Iron and Coke business has enabled us to secure an unequaled line of Blast Furnace and Coke Oven connections.

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MALLEABLE FOUNDRY
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Pig Iron from furnaces located in all the producing sections of the U. S. Also

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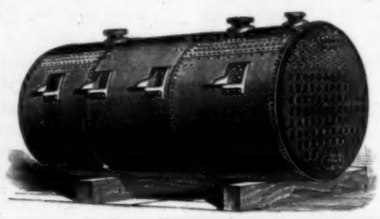

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MONTREAL, Homer Taylor, 183 St. James St.
SAN FRANCISCO, John Woodlock, 154-156 First St.

The manufacturig world is kept busy these days filling orders and some manufacturers seem to have acquried the notion that the present is a capital season for postponing their advertising. "Wait," they say, "until business slackens. Then we will advertise to secure orders." That is to say, "Wait until dealers are all stocked up for the forthcoming year and then we will advertise for the fag ends of the season's business." The man who adopts this policy will be advertising at the very time his shrewder competitor, who adverties now, will be busy filling the cream of the late orders. It is all very well to be rushed with orders now; but if you want this state of things to continue you must work to secure orders for the future.—[American Artisan.

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the situation there depends upon the confidence shown in the iron and steel industry in this country and in our holding prices up. During my trip I sold 25,000 tons of iron to one customer and have two other negotiations pending which are for 100,000 tons each. The consummation of these deals was necessarily delayed on account of the irregular status of our own market, and the sensational reports sent over from here. The whole result of my journey was to inspire additional confidence in the solidity of the export trade which Tennessee Coal & Iron Co. controlled, bearing in mind that it has already for the past four years done an export business approaching 100 000 tons per annum, in pig iron. To this will be added the orders which I find we will be able to take for steel, bar iron, light rails, coal and coke. I was offered orders in Italy for fuel running into hundreds of thousands of tons. The whole continent of Europe is suffering for fuel and this in turn must react upon the iron trade by holding up the cost of production. The confidence of Germany in the situation is most marked by its purchase of the entire output of the new Swedish ore fields up to 1912."

WITHIN the past three months the various lake yards of the American Shipbuilding Co. have launched 12 mammoth freight-carrying steamers, including two 500-foot boats. These craft cost $4,500,000, and their combined carrying capacity is 70,000 tons. There are now on the stocks in the yards of the company 11 more large craft, the combined carrying capacity of which is 60,000 tons; cost, $4,000,000. Here are 23 new

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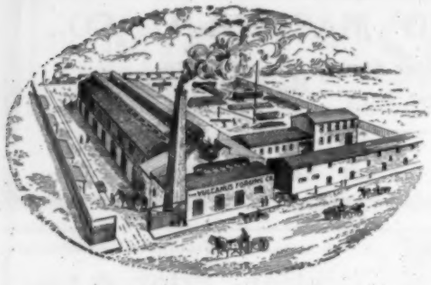
craft, with carrying capacity of 130,000 tons, costing $8 500,000. In lake shipyards outside of the American company craft have been launched, or are almost ready, with a capacity of 40,000 tons, making a total of new tonnage of the largest class of 170,000, and a total valuation of about $11,500,000.

At the annual meeting of the stockholders of the Virginia Iron, Coal & Coke Co., held at Pulaski, Va., May 15, the following board of directors was elected: George L. Carter, E. J. Berwind, H. K. McHarg, B. L. Dulaney, G. B. Schley, George A. Crocker, and Charles B. Squire. The company was organized about a year ago and efforts have been largely directed toward the opening of ore and coal mines and the extensions and equipment of the company's railroad, that its business might be conducted at a minimum cost. The company now has 13 furnaces, steel plant, coal and ore mines and 800 coke ovens, with others in process of construction; it has also 140 miles of standard gauge railroad, 150,000 acres of coal lands, 90,000 acres of iron ore land, foundries, machine shops, horseshoe and rolling mill, pipe works, etc. The board of directors organized by reëlecting George L. Carter, president, Cornelius Shields, vice-president and general manager, and E. B. Craig, treasurer.

Thomas R. Davis, who has been connected with the Crosby Steam Gauge & Valve Co., for a number of years, is now with James Bonar & Co., of Pittsburg. Mr. Davis will look after the sale of Pittsburg feed-water heaters, Bonar oil filters, Bonar gauge cocks, and other appliances which James Bonar & Co. have.



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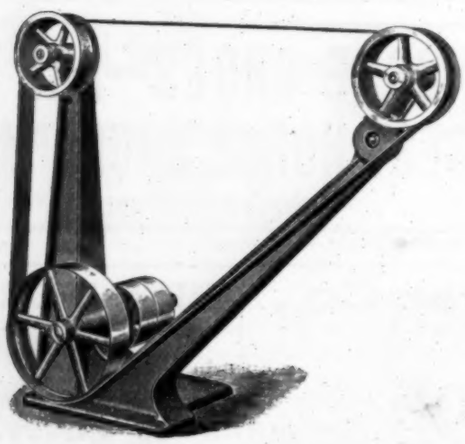

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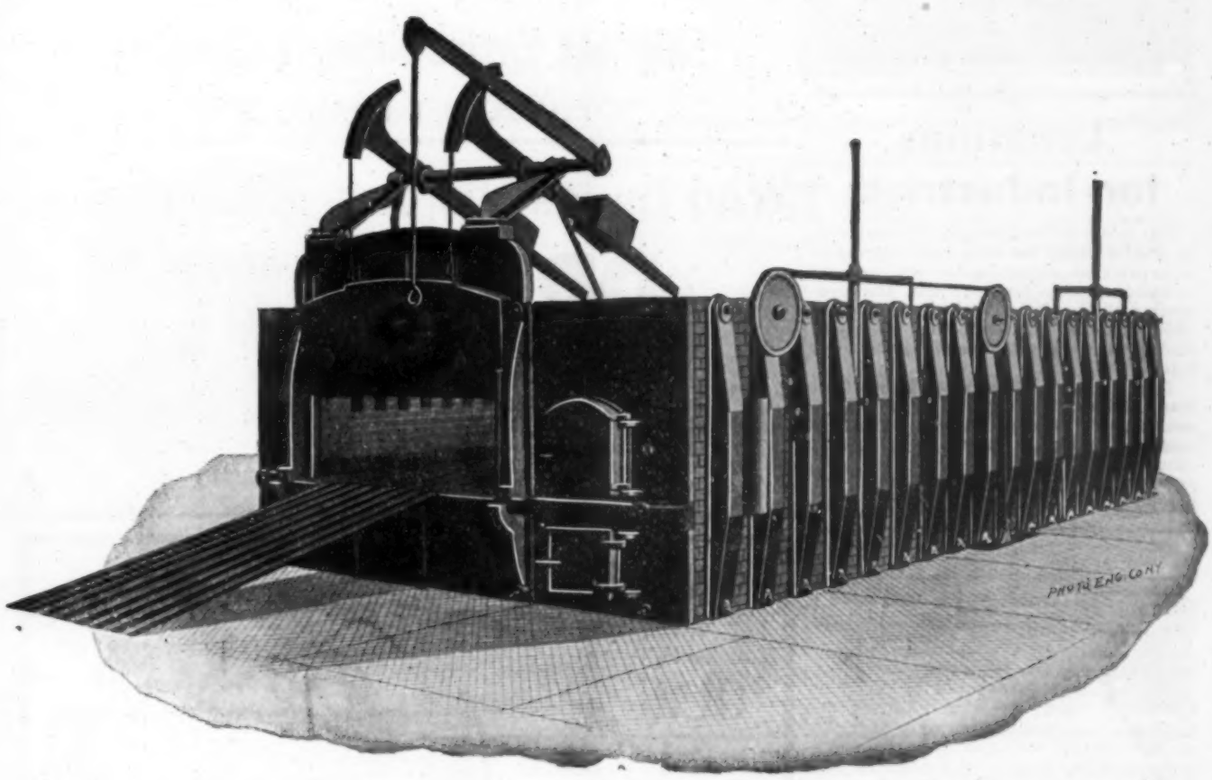

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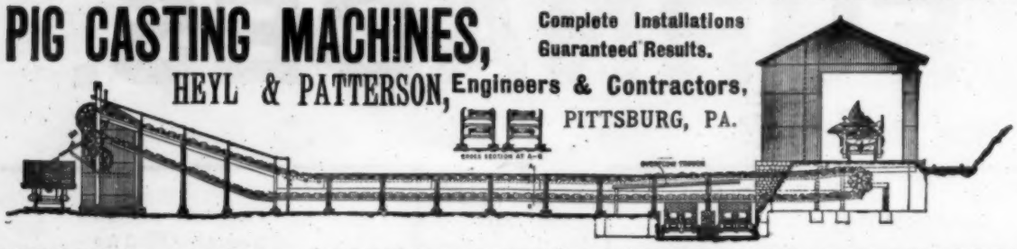

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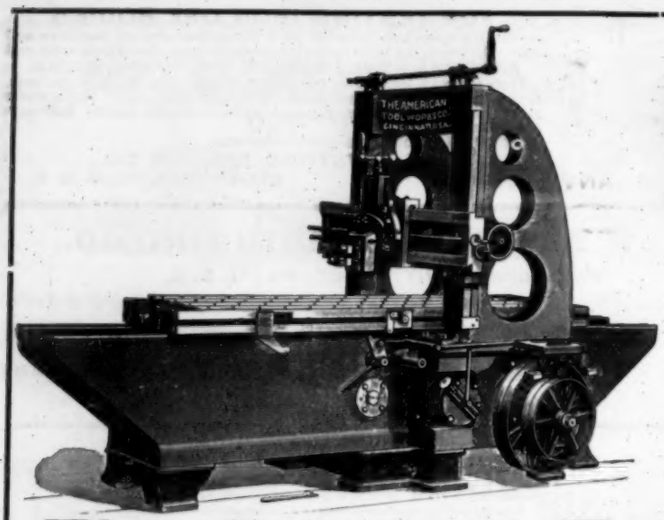

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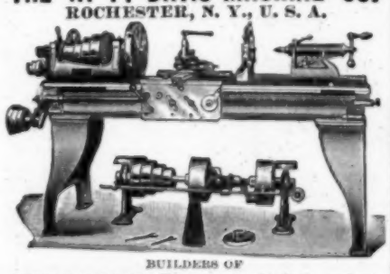

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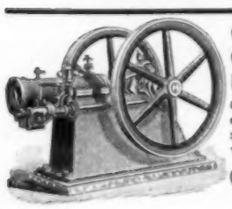

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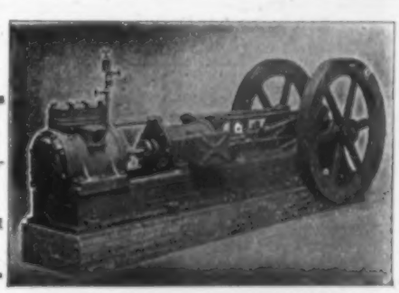

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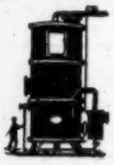

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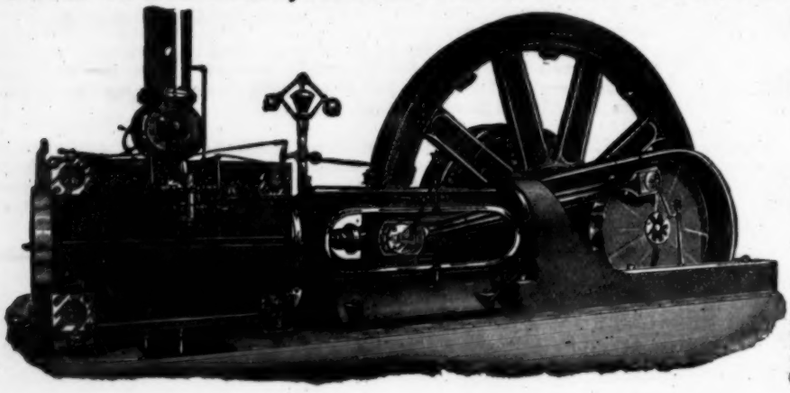

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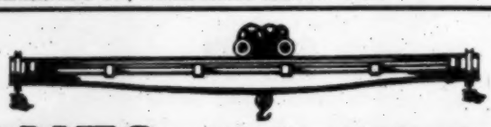

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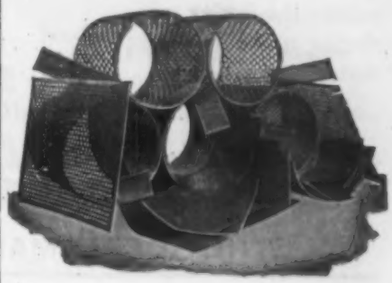

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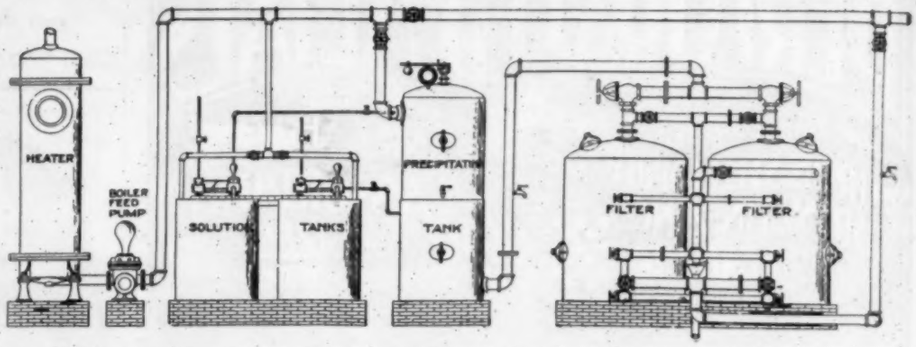

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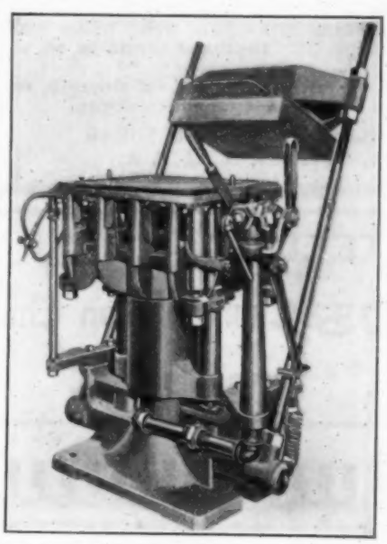

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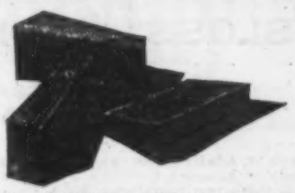

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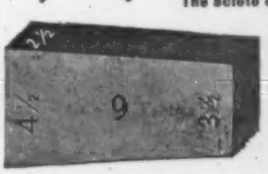

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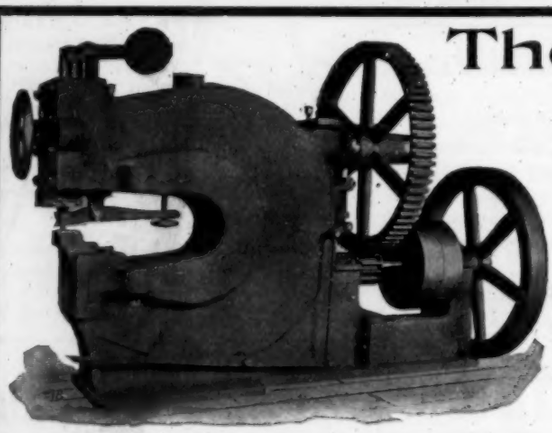

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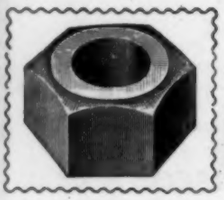

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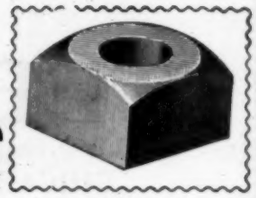

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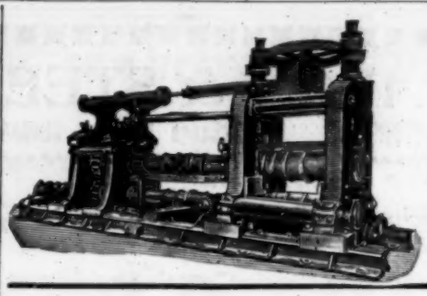

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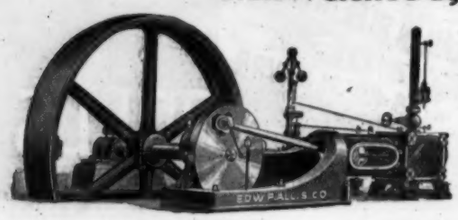

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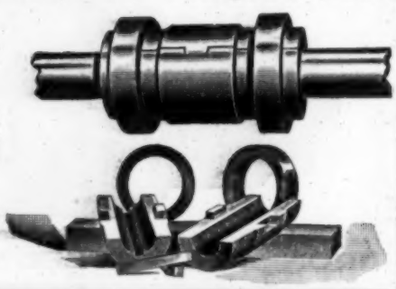

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A. F. Smith & Co., New Brighton, Pa.
Chas. Taylor's Sons Co. Cincinnati, O.
A. J. Hawes & Son, Johnstown, Pa.

FIRE PROOF COVERING—
C. H. Besly & Co., Chicago, Ill.

FLUE PLUGS—
Reinhold Betterman, Johnstown, Pa.

FOOT AND POWER LATHES—
U. Baird Machinery Co., Pittsburg, Pa.

FORGINGS—
Chicago Drop Forge & Foundry Co., Kensington, Ill.
Cleveland City Forge & Iron Co., Cleveland, O.
Bethlehem Steel Co., South Bethlehem, Pa.
Braeburn Steel Co., Braeburn, Pa.
Wyman & Gordon, Worchester, Mass.
Danielson Machine & Tool Co., Cleveland, O.
Samuel Trethewey & Co., Pittsburg, Pa.
Jas. H. Baker Mfg. Co., Pittsburg, Pa.
Joseph Dyson & Sons, Cleveland, O.
Frankford Steel & Forging Co., Philadelphia, Pa.
J. & G. Obenberger, Milwaukee, Wis.
Pilling & Crane, Philadelphia, Pa.
Vulcanus Forging Co., Cleveland, O.

FOUNDRIES—
Wm. Tod & Co., Youngstown, O.
Seaman, Sleeth Co., Pittsburg, Pa.
Hooven, Owens & Rentschler Co., Hamilton, O.
Link Belt Machinery Co., Chicago, Ill.
W. A. Jones Foundry Co., Chicago.
Jeffrey Mfg. Co., Columbus, O.
Brass Founders' Supply Co., Newark, N. J.
The Aultman Co., Canton, O.
Schuylkill Iron & Steel Co., Philadelphia, Pa.
Wheeling Mold & Foundry Co., Wheeling, W.Va
Macbeth & Co., Cleveland, O.

FOUNDRY EQUIPMENT.
Tabor Mfg. Co., Elizabeth, N. J.
Brass Founders Supply Co., Newark, N. J.
Vulcan Mfg. Co., Pittsburg, Pa.
Northern Engineering Works, Detroit, Mich.
Cleveland Crane & Car Co., Cleveland, O.
Whiting Foundry Equipment Co., Harvey, Ill.
Thos. Furlow & Son, Philadelphia, Pa.
Maywood Foundry & Machine Co., Chicago, Ill.

FOUNDRY FACINGS—
Cleveland Facing Mill Co., Cleveland, O.

FOUNDRY SUPPLIES—
Northern Engineering Works, Detroit, Mich.
Chas. Taylor's Sons Co., Cincinnati, O.
Clearfield Fire Brick Co., Clearfield, Pa.
Cleveland Crane & Car Co., Cleveland, O.
Thos. Furlow & Son, Philadelphia, Pa.
The Ohio Sand Co., Conneaut, O.
Union Mining Co., Mt. Savage, Md.
Dover Fire-Brick Co., Cleveland, O
A. F. Smith & Co., New Brighton, Pa.
Tabor Mfg. Co., Elizabeth, N. J.
F. B. Stevens, Detroit, Mich.
Whiting Foundry Equipment Co Harvey, Ill.
W. H. Haws Fire Brick Co., Mt. Union, Pa.
Cleveland Facing Mill Co., Cleveland. O.
Garden City Sand Co., Chicago, Ill.
Chicago Fire Brick Co., Chicago, Ill.
Brass Founders' Supply Co., Newark, N. J.
Vulcan Mfg. Co., Pittsburg, Pa.
Scioto Star Fire Brick Works, Portsmouth, O.
Kentucky Fire Brick Works, Portsmouth, O.
Webster Fire Brick Co., South Webster, O.
J. V. Rose, Sharon, Pa.
Oak Hill Fire Brick & Coal Co., Oak Hill, O.
F. B. Holmes & Co., Detroit, Mich.
Newport Sand Bank Co., Newport, Ky.
Maywood Foundry & Machine Co., Chicago, Ill.
A. J. Haws & Son, Johnstown, Pa.

FRICTION METAL—
James B. Clow & Sons, Chicago, Ill.
Theo. Hiertz & Son, St. Louis, Mo.
C. H. Besly & Co., Chicago, Ill.
Swarts Metal Refining Co., Chicago, Ill.
Perfect Lubricating Metal Co., Cincinnati, O.
J. J. Ryan & Co., Chicago. Ill.
D. Clint Prescott Co., Chicago, Ill.

FURNACE LININGS—
Union Mining Co., Mt. Savage, Md.

FURNACE, MELTING—
Whiting Foundry Equipment Co., Harvey, Ill.

FUEL OIL BURNERS—
Rockwell Engineering Co., New York City.

GALVANIZED IRON—
American Sheet Steel Co., New York City.
McCullough Iron Co., Wilmington, Del.

GALVANIZERS—
American Sheet Steel Co., New York City.

GALVANIZING POTS—
The Wm. B. Pollock Co., Youngstown, O.

GAS ENGINES—
Northern Engineering Works, Detroit, Mich.
Columbus Machine Co., Columbus, O.

GAS PRODUCERS—
W. W. Lindsay & Co., Philadelphia, Pa.

GAUGE COCKS—
James Bonar & Co., Pittsburg, Pa.

GEARING—
I. & E. Greenwald Co., Cincinnati, O.
The R. D. Nuttall Co., Allegheny, Pa.
The Van Dorn & Dutton Co., Cleveland, O.
F. H. Bultman & Co., Cleveland, O.
Fraser & Chalmers, Chicago, Ill.
Southwark Foundry & Machine Co., Philadelphia, Pa.
James Bonar & Co., Pittsburg, Pa.
Nazel & Bassett, Philadelphia, Pa.
Link Belt Machinery Co., Chicago, Ill.

GEAR CUTTERS—
F. H. Bultman & Co., Cleveland, O.

GEAR CUTTING—
The R. D. Nuttall Co., Allegheny, Pa
The Van Dorn & Dutton Co., Cleveland, O.
F. H. Bultman & Co., Cleveland, O.

GEAR LUBRICANTS—
The Ironsides Company, Columbus, O.

GIRDER WORK—
Wm. B. Scaife & Sons, Pittsburg, Pa.

GRINDSTONES—
C. H. Besly & Co., Chicago, Ill.

GRAPHITE PAINT—
Jos Dixon Crucible Co., Jersey City, N. J.

GRATE BARS—
Geo. B. Sennett Co., Youngstown, Ohio.

GRAY IRON CASTINGS—
W. A. Jones Foundry Co., Chicago, Ill.
Brass Founders' Supply Co., Newark, N. J.

HACK SAWS—
O & C Co., Chicago, Ill.
Cleveland Punch & Shear Wks. Co., Cleveland, O

HANGERS—
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Jones & Laughlins, Ltd., Pittsburg, Pa.
I. & E. Greenwald Co., Cincinnati, O.
Link Belt Machinery Co. Chicago, Ill.

HARNESS SNAPS—
Covert Mfg. Co., West Troy, N. Y.

HEATERS AND PURIFIERS—
Harrison Safety Boiler Works, Philadelphia.
James Bonar & Co., Pittsburg, Pa.
Wefugo Co., Cincinnati, O.
The United Boiler Co., Girard, O.
The Ideal Manufacturing Co., Buffalo N. Y.

HEAVY HARDWARE—
C. H. Besly & Co., Chicago, Ill.

HOISTS—
The Aultman Co., Canton, O.
Lidgerwood Mfg. Co., New York City.

HOISTING ENGINES—
The Edward P. Allis Co., Milwaukee, Wis.
Lidgerwood Mfg. Co., New York City.
Exeter Machine Works, Pittston, Pa.
The Aultman Co., Canton, O.
Webster, Camp & Lane Machine Co., Akron, O.
J. & G Obenberger, Milwaukee, Wis.

HOISTING MACHINERY—
Exeter Machine Works, Pittston, Pa.
Link-Belt Machinery Co., Chicago, Ill.
Jeffrey Mfg. Co., Columbus, O.
Lidgerwood Mfg. Co., New York City.
Heyl & Patterson, Pittsburg, Pa.
The Aultman Co., Canton, O.
The Brown Hoisting and Conveying Machine Co., Cleveland, O.
Webster, Camp & Lane Machine Co., Akron, O.
J. & G. Obenberger, Milwaukee, Wis.

HOLLOW SHAFTING—
Atlantic Tube Co., Pittsburg, Pa.

HORSE SHOES—
Phoenix Horse Shoe Co., Joliet, Ill.

INDUSTRIAL CARS—
The Pressed Steel Car Co., Pittsburg, Pa.

INGOT MOLDS—
Lorain Foundry Co., Lorain, O.

INJECTORS—
C. H. Besly & Co., Chicago, Ill.
James Bonar & Co., Pittsburg, Pa.

INSURANCE COMPANIES—
Hartford Steam Boiler I. & I. Co., Hartford, Ct.

IRON BUILDINGS—
Illinois Steel Co., Chicago, Ill.
Schiffler Bridge Co., Pittsburg, Pa.
Riter-Conley Co., Pittsburg, Pa.
Wm. B. Scaife & Sons, Pittsburg, Pa.

IRON, NAILS AND STEEL—
C. H. Besly & Co., Chicago, Ill.
E. H. Stroud & Co., Chicago, Ill.

IRON AND STEEL ROOFING—
Berger Mfg. Co., Canton, O.
Wm. B. Scaife & Sons, Pittsburg, Pa.
McCullough Iron Co., Wilmington, Del.

IRON ORE—
Lake Superior Consolidated Iron Mines New York City, N. Y.
Oglebay, Norton & Co., Cleveland, O.
Pickands, Brown & Co., Chicago, Ill.
M. A. Hanna & Co., Cleveland, O.
Drake Bartow & Co., Cleveland, O.
Pickands, Mather & Co., Cleveland, O.
J. Wesley Pullman, Philadelphia, Pa.
Tod, Stambaugh & Co., Cleveland, O.

IRON WORKING TOOLS—
Avery Stamping Co., Cleveland, O.
American Tool Works Co., Cincinnati, O.
Cleveland Punch & Shear Wks. Co ,Cleveland,O.
H. Bickford, Lakeport, N. H
C. H. Besly & Co., Chicago, Ill.
U. Baird Machinery Co., Pittsburg, Pa.
Armstrong Bros. Tool Co., Chicago, Ill.
F. H. Bultman & Co., Cleveland, O.
The Armstrong Mfg. Co., Bridgeport, Conn.
Bickford Drill & Tool Co., Cincinnati, O.
W. P. Davis Machine Co., Rochester, N. Y.
Bertsch & Co., Cambridge City, Ind.

LADLES—
Northern Engineering Works, Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.
The United Boiler Co., Girard, O.
Wm. B. Pollock Co., Youngstown, O.

LAG SCREWS—
Vulcanus Forging Co., Cleveland, O.

LATHES—
W. P. Davis Machine Co., Rochester, N. Y.
U. Baird Machinery Co., Pittsburg, Pa.
Bickford Drill & Tool Co., Cincinnati, O.
Danielson Machine & Tool Co., Cleveland, O.
American Tool Works Co., Cincinnati, O.

LINK BELTING—
The Jeffrey Mfg. Co., Columbus, O.
Link-Belt Machinery Co., Chicago, Ill.
Heyl & Patterson, Pittsburg, Pa.
The Aultman Co., Canton, O.

LOCOMOTIVES—
Hyde Bros. & Co., Pittsburg, Pa.

LUBRICANTS—
The Ironsides Co., Columbus, O.

MACHINISTS' TOOLS AND SUPPLIES—
American Tool Works Co., Cincinnati, O.
W. P. Davis Machine Co., Rochester, N. Y.
H. Bickford, Lakeport, N. H.
C. H. Besly & Co., Chicago, Ill.
U. Baird Machinery Co., Pittsburg, Pa.
Bertsch & Co., Cambridge City, Ind.
Armstrong Bros. Tool Co., Chicago, Ill.
Bickford Drill & Tool Co., Cincinnati, O.
Danielson Machine & Tool Co., Cleveland, O.
F. H. Bultman & Co., Cleveland, O.
Cleveland Punch & Shear Wks. Co., Cleveland, O.
Nazel & Bassett Philadelphia, Pa.
The Coulter & McKenzie Machine Co., Bridgeport, Conn

MACHINE SCREWS—
C. H. Besly & Co., Chicago, Ill.

MACHINE SHOPS—
The R. D. Nuttall Co., Allegheny, Pa.
Danielson Machine & Tool Co., Cleveland, O.

MACHINERY AND TOOL STEEL—
C. H. Besley & Co., Chicago, Ill.
Bræburn Steel Co., Bræburn, Pa.
Crescent Steel Co., Pittsburg, Pa.
La Belle Steel Co., Pittsburg, Pa
Byron H. White, Chicago, Ill.
Morris & Bailey Steel Co., Pittsburg, Pa.
Monongahela Iron & Steel Co., Pittsburg, Pa.

MAGNESIA COVERING—
C. H. Besly & Co., Chicago, Ill.
James B. Clow & Sons, Chicago, Ill.

MALLEABLE FOUNDRY PLANTS—
Whiting Foundry Equipment Co., Harvey, Ill.

MALLEABLE CASTINGS—
Acme Steel & Malleable Iron Works, Buffalo, N. Y.
Link Belt Machinery Co., Chicago, Ill.

MANILLA ROPE COATING—
The Ironsides Co., Columbus, O.

MANUFACTURING CHEMISTS—
The Ideal Manufacturing Co., Buffalo, N. Y.
Wefugo Co., Cincinnati, O.
Grasselli Chemical Co., Cleveland, O.

MANUFACTURED IRON AND STEEL—
Bourne-Fuller & Co., Cleveland, O.
Champion Iron & Steel Co., Muskegon, Mich.
The Morris & Bailey Steel Co., Pittsburg, Pa.
Cabeen Co., Philadelphia, Pa.
Republic Iron & Steel Co., Chicago, Ill.
Monongahela Iron & Steel Co., Pittsburg, Pa.
National Steel Co., New York City.

METAL BEARINGS—
Theo. Hiertz & Son, St. Louis, Mo.
C. H. Besly & Co., Chicago, Ill.
Perfect Lubricating Metal Co., Cincinnati, O.
Swarts Metal Refining Co., Chicago, Ills.
J. J. Ryan & Co., Chicago, Ill.
D. Clint Prescott Co., Chicago, Ill.

METAL CEILINGS—
Berger Manufacturing Co., Canton, O.

METAL WORK—
Avery Stamping Co., Cleveland, O.

MILL CASTINGS—
Schuykill Iron & Steel Co., Philadelphia, Pa.
A. Garrison Foundry Co., Pittsburg, Pa.

MILLING MACHINES—
American Tool Works Co., Cincinnati, O.
W. P. Davis Machine Co., Rochester, N. Y.
U. Baird Machinery Co., Pittsburg, Pa.
Danielson Machine & Tool Co., Cleveland, O.

MINING MACHINERY—
C. H. Besly & Co., Chicago, Ill.
The Edward P. Allis Co., Milwaukee, Wis.
Jeffrey Mfg. Co., Columbus, O.
Lidgerwood Mfg. Co., New York City.
Exeter Machine Works, Pittson, Pa.
Wm. Cramp & Sons, Philadelphia, Pa
The Bucyrus Co., South Milwaukee, Wis.
Marion Steam Shovel Co., Marion, O.
Webster, Camp & Lane Machine Co., Akron, O.
Fraser & Chalmers, Chicago, Ill.
Wm. B. Pollock Co., Youngstown, O.
J. & G. Obenberger, Milwaukee, Wis.
Link Belt Machinery Co., Chicago, Ill.
Thew Automatic Shovel Co., Lorain, O.

MINE PUMPS—
F. M. Prescott Steam Pump Co., Milwaukee, Wis.

MOLDING MACHINES—
Tabor Mfg. Co., Elizabeth, N. J.
Whiting Foundry Equipment Co., Harvey, Ill.
Thos. Furlow & Son, Philadelphia, Pa.
Maywood Foundry & Machine Co., Chicago, Ill.

MOLDING SAND—
Ohio Sand Co., Conneaut, O.
F. B. Stevens, Detroit, Mich.
Garden City Sand Co., Chicago, Ill.
Newport Sand Bank Co., Newport, Ky.

MULTIPLE DRILLS—
Bickford Drill and Tool Co., Cincinnati, O.
Cleveland Punch & Shear Wks. Co., Cleveland, O

NICKEL PLATING OUTFITS—
Northampton Emery Wheel Co., Chicago, Ill.

NUTS (Self-Locking)—
National Elastic Nut Co., Milwaukee, Wis.

NUTS AND BOLTS—
Upson Nut Co., Cleveland, O.
National Elastic Nut Co., Milwaukee, Wis.
Milton Manufacturing Co., Milton, Pa.

OILLESS BEARINGS—
C. H. Besly & Co., Chicago, Ill.

OIL BURNERS—
Rockwell Engineering Co., New York City.

OIL CUPS—
C. H. Besly & Co., Chicago, Ill.
James Bonar & Co., Pittsburg, Pa.

OIL FILTERS—
James Bonar & Co., Pittsburg, Pa.

OIL PUMPS—
C. H. Besly & Co., Chicago, Ill.

OIL STORAGE TANKS—
Wm. B. Pollock Co., Youngstown, O.

OIL SEPARATORS—
Harrison Safety Boiler Works, Philadelphia, Pa.
American Tool Works Co., Cincinnati, O.

OIL TANKS AND CARS—
Wm. B. Pollock Co., Youngstown, O.

ORE CARS—
The Pressed Steel Car Co. Pittsburg, Pa.

ORE CRUSHERS—
The Edward P. Allis Co., Milwaukee, Wis.
Jeffrey Mfg. Co., Columbus, O.
The Aultman Co., Canton, O.
Fraser & Chalmers Chicago, Ill.

ORE SCREENS—
Rob't Aitchison Per. Metal Co., Chicago, Ill.
The Aultman Co., Canton, O.
Fraser & Chalmers, Chicago, Ill.
James Bonar & Co., Pittsburg, Pa.
Hendrick Mfg. Co., Carbondale, Pa.
Western Machinery & Supply Co., Chicago, Ill.

ORE TESTING MACHINERY—
Keystone Driller Co., Beaver Falls, Pa

PACKING—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.
James B. Clow & Sons, Chicago, Ill.

PAINT—
Iron Clad Paint Co., Cleveland, O.
Jos. Dixon Crucible Co., Jersey City, N. J.
The Ironsides Co., Columbus, O.

PATENT ATTORNEYS—
Wm. N. Cromwell, Washington, D. C.

PATTERN WORKS—
Gobeille Pattern Co., Cleveland O
Forsythe Pattern Works, Youngstown, O.
C. Birnbaum, Cleveland, O.

PERFORATED METALS—
Aitchison Perforated Metal Co., Chicago, Ill.
Fraser & Chalmers, Chicago, Ill.
Hendrick Mfg. Co., Carbondale, Pa.
Western Machinery & Supply Co., Chicago, Ill.

PIG IRON—
Cabeen Co., Philadelphia, Pa.
Rogers, Brown & Co., Cincinnati, O.
Reed F. Blair & Co., Pittsburg, Pa.
Clinton Iron & Steel Co., Pittsburg.
Bourne-Fuller Co. Cleveland, O.
M. A. Hanna & Co., Cleveland, O.
B. H. Stroud & Co., Chicago, Ill.
Pickands, Brown & Co., Chicago, Ill
F. B. Stevens, Detroit, Mich.
McKeefrey & Co., Leetonia, O.
Superior Charcoal Iron Co., Grand Rapids, Mich
Spearman Iron Co., Sharpsville, Pa.
Hickman, Williams & Co., Chicago, Ill,
Pickands, Mather & Co., Cleveland, O.
Republic Iron & Steel Co., Chicago, Ill.
American Steel Hoop Co., Pittsburg, Pa.
American Steel & Wire Co., Chicago, Ill,
J. H. Hillman & Son, Pittsburg, Pa.
C. R. Baird & Co., Philadelphia, Pa.
Pilling & Crane, Philadelphia Pa.
Sloss Sheffield Steel & Iron Co., Birmingham, Ala
Sloss Iron & Steel Co., Birmingham, Ala.
Cherry Valley Iron Co., Pittsburg, Pa.

PIG IRON CASTING APPARATUS—
Heyl & Patterson, Pittsburg, Pa.

PIPE (CAST IRON)—
James B. Clow & Sons, Chicago, Ill.
Massillon Iron & Steel Co., Chicago, Ill.

PIPE (RIVETED STEEL)—
Wm. B. Scaife & Sons, Pittsburg, Pa.
Wm. B. Pollock Co., Youngstown, O.

PIPE COVERING—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.

PIPE CUTTING AND THREADING MACHINES—
The Armstrong Mfg. Co., Bridgeport, Conn.

PIPE FOUNDRY PLANTS—
Whiting Foundry Equipment Co., Harvey, Ill.

PISTON RODS—
Bethlehem Steel Co., So. Bethlehem, Pa.

PLANERS—
W. P. Davis Machine Co., Rochester, N. Y.
U. Baird Machinery Co., Pittsburg, Pa.
Bickford Drill & Tool Co., Cincinnati, O.
Danielson Machine & Tool Co., Cleveland, O
American Tool Works Co., Cincinnati, O.

PLATES—
Enterprise Boiler Co., Youngstown, O.
Republic Iron & Steel Co., Chcago, Ill.
Illinois Steel Co., Chicago, Ill.
W. W. Lindsay & Co., Philadelphia, Pa.

PLUMBERS' AND GAS FITTERS' SUPPLIES—
C. H. Besly & Co., Chicago, Ill.
James B. Clow & Sons, Chicago, Ill.

PNEUMATIC APPLIANCES—
Clayton Air Compressor Works, New York.
Q & C Co., Chicago, Ill.
W. J. Schaefer & Co., New York City.

PORTABLE FORGE—
C. H. Besly & Co., Chicago, Ill.
Vulcan Mfg. Co., Pittsburg, Pa.

POWER DROP HAMMERS—
Mossberg & Granville Mfg. Co., Providence, R.I.

POWER PRESSES—
Avery Stamping Co., Cleveland, O.
Bertsch & Co., Cambridge City, Ind.
Cleveland Punch & Shear Wks. Co., Cleveland, O.
E. Konigslow & Bro. Cleveland, O.
Danielson Machine & Tool Co., Cleveland, O.
Mossberg & Granville Mfg. Co., Providence, R.I.

POWER TRANSMISSON MACHINERY—
Jeffrey Mfg. Co., Columbus, O.
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Jones & Laughlins, Ltd., Pittsburg, Pa.
L. & E. Greenwald Co., Cincinnati, O.
Link Belt Machinery Co., Chicago, Ill.

PRESSES—
Bertsch & Co., Cambridge City, Ind.
C. H. Besly & Co., Chicago, Ill.
E. Konigslow & Bro. Cleveland, O.
Danielson Machine & Tool Co., Cleveland, O.
Avery Stamping Co., Cleveland, O.
Mossberg & Granville Mfg. Co., Providence, R.I.
Cleveland Punch & Shear Wks. Co., Cleveland, O.

PRESSURE GAUGES—
The Bristol Co., Waterbury, Conn.
James Bonar & Co., Pittsburg, Pa.

PULLEYS—
W. A. Jones Foundry Co., Chicago, Ill
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Jeffrey Mfg. Co., Columbus, O.
Jones & Laughlins, Ltd., Pittsburg, Pa
L. & E. Greenwald Co., Cincinnati, O.
Link Belt Machinery Co., Chicago, Ill.

PUMPS (STEAM)—
The Edward P. Allis Co., Milwaukee, Wis
Blakeslee Mfg. Co., Du Quoin, Ill.
Fred M. Prescott Steam Pump Co., Milwaukee Wis.
Hall Steam Pump Co., Pittsburg, Pa.
Southwark Foundry & Machine Co., Philadelphia, Pa.

PUNCHES—
E. Konigslow & Bro. Cleveland, O.

PYROMETERS—
Edward Brown, Philadelphia, Pa.
Vulcan Mfg. Co., Pittsburg, Pa.

RADIAL DRILLS—
Bickford Drill and Tool Co., Cincinnati, O.
American Tool Works Co., Cincinnati, O.

RAILS—
Hyde Bros. & Co., Pittsburg, Pa.

RAILWAY SUPPLIES—
Cleveland City Forge & Iron Co., Cleveland, O.
Garden City Sand Co., Chicago, Ill.
Hyde Bros & Co., Pittsburg, Pa.

RAW HIDE GEARS—
Nasel & Bassett, Philadelphia, Pa.

RELAYING RAILS—
Hyde Bros. & Co., Pittsburg, Pa.

RIVETS—
Champion Rivet Co., Cleveland, O.
Jones & Laughlins, Ltd., Pittsburg, Pa.
Youngstown Rivet Co., Youngstown, O.
Vulcanus Forging Co., Cleveland, O.

RIVETED STEEL PIPE—
The Wm. B. Pollock Co. Youngstown, O.

ROCK DRILLS—
Rand Drill Co., Chicago, Ill.
The Ingersoll-Sergeant Drill Co., New York.

ROLL FORGINGS—
Samuel Trethewey & Co., Pittsburg, Pa.
Frankford Steel & Forging Co., Philadelphia, Pa.

ROLLER BEARINGS—
Mossberg & Granville Mfg. Co., Providence, R.I.

ROLLING MILLS—
Mossberg & Granville Mfg. Co., Providence, R.I.

ROLLING MILL MACHINERY—
The United Boiler Co., Girard, O.
Totten & Hogg Iron and Steel Foundry Co., Pittsburg, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.
The Lloyd Booth Co., Youngstown, O.
Mossberg & Granville Mfg. Co., Providence, R.I.
West Penn Foundry & Machine Co., Avonmore, Pa.
Frank-Kneeland Machine Co., Pittsburg, Pa.
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O
A. Garrison Foundry Co., Pittsburg, Pa.

ROOFS—
Shiffler Bridge Co., Pittsburg.
Riter-Conley Mfg. Co., Pittsburg, Pa.
Wm. B. Scaife & Sons, Pittsburg, Pa.
McCullough Iron Co., Wilmington, Del.

ROPE AND CORDAGE—
Waterbury Rope Co., New York City.
Link Belt Machinery Co., Chicago, Ill.

SAWS—
Peter Gerlach & Co., Cleveland, O.

SCRAP IRON—
Hyde Bros. & Co., Pittsburg, Pa.
Illinois Steel Co., Chicago, Ill.

SCREENS FOR COAL, ORE, ETC.—
Robt. Aitchison Perforated Metal Co., Chicago
Hendrick Mfg. Co., Carbondale, Pa.
Jeffrey Mfg. Co., Columbus, O.
The Aultman Co., Canton, O.
Fraser & Chalmers, Chicago, Ill.
Western Machinery & Supply Co., Chicago, Ill.

SCREWS—
C. H. Besly & Co., Chicago, Ill.
Upson Nut Co., Cleveland, O.
Chicago Screw Co., Chicago, Ill

SCREW MACHINES—
American Tool Works Co., Cincinnati, O.

SECOND-HAND MACHINERY—
Hyde Bros & Co., Pittsburg, Pa.
Russell Machine Co., Pittsburg, Pa.
George H. Bowler, Cleveland, O.
Wm. W. Whitehead, Davenport, Iowa.

SENSITIVE DRILLS—
American Tool Works Co., Cincinnati, O.

SEPARATORS—
Harrison Safety Boiler Works, Philadelphia, Pa.
James Bonar & Co., Pittsburg, Pa.

SHAFTING—
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
Pittsimmons & Co., Cleveland, O.
The Aultman Co., Canton, O.
Atlantic Tube Co., Pittsburg, Pa.
Jeffrey Mfg. Co., Columbus, O.
Jones & Laughlins, Ltd., Pittsburg, Pa.
L. & E. Greenwald Co., Cincinnati, O.
Bethlehem Steel Co., South Bethlehem, Pa.
American Steel & Wire Co., Chicago, Ill.
Link Belt Machinery Co., Chicago, Ill.

SHAPE IRON AND STEEL—
W. W. Lindsay & Co., Philadelphia, Pa.

SHAPERS—
W. P. Davis Machine Co., Rochester, N. Y.
American Tool Works Co., Cincinnati, O.

SHEARING AND PUNCHING MACHINERY—
Bertsch & Co., Cambridge City, Ind.
Danielson Machine & Tool Co., Cleveland, O.
American Tool Works Co., Cincinnati, O.
Cleveland Punch & Shear Wks. Co., Cleveland, O.
Mossberg & Granville Mfg. Co., Providence, R.I.

SHEAR KNIVES—
Samuel Trethewey & Co., Pittsburg, Pa.

SHEET IRON AND STEEL—
B. H. Stroud & Co., Chicago. Ill.
Republic Iron & Steel Co., Chicago, Ill.
American Sheet Steel Co., New York City.
McCullough Iron Co., Wilmington, Del.

SHIP YARDS—
Wm. Cramp & Sons, Philadelphia, Pa.

SOLID STEEL SHEAR KNIVES—
Samuel Trethewey & Co., Pittsburg, Pa.

SPECIAL MACHINERY—
Cleveland Punch & Shear Wks. Co., Cleveland, O.
American Tool Works Co., Cincinnati, O.
James Bonar & Co., Pittsburg, Pa.
Avery Stamping Co., Cleveland, O.
Mossberg & Granville Mfg. Co., Providence, R.I.
Q & C Co., Chicago, Ill.
The Aultman Co., Canton, O.
Jeffrey Mfg. Co., Columbus, O.
E. Konigslow & Bro. Cleveland, O.
Wheeling Mold & Foundry Co., Wheeling, W. Va.
Danielson Machine & Tool Co., Cleveland, O.
Nasel & Bassett, Philadelphia, Pa.

STACKS—
Wm. B. Scaife & Sons, Pittsburg, Pa.

STAND PIPES—
The Wm. B. Pollock Co., Youngstown, O.
The United Boiler Co., Girard, O.

STEAM BOILER INSPECTORS—
Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn.

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Baltimore and Washington	* 2:10 pm	*11:30 am
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Ravenna and Alliance	* 5:10 pm	* 8:35 am
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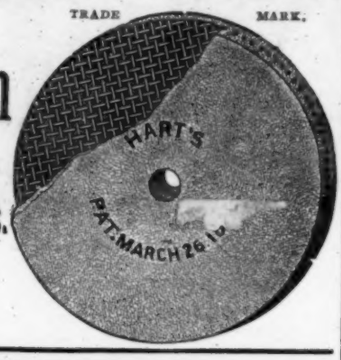

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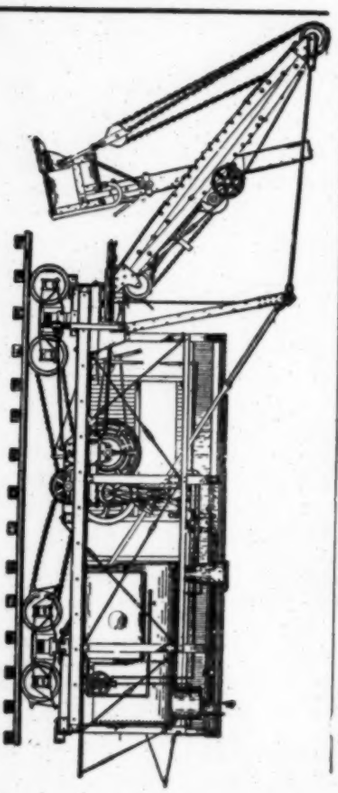

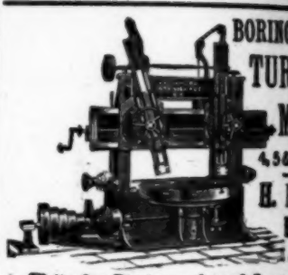

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